

Fall 1985

## Focal Spot, Fall 1985

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ANNEX

FOCAL SPOT

# FOCAL

## M A G A Z I N E

Mallinckrodt Institute of Radiology

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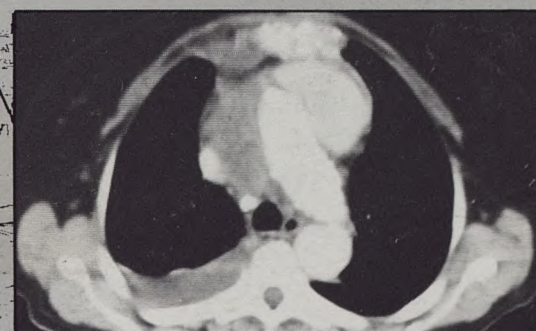
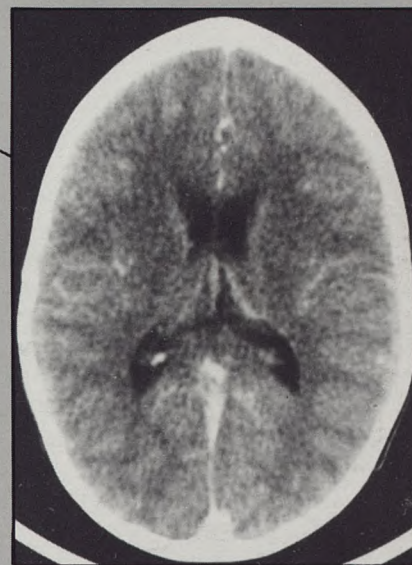
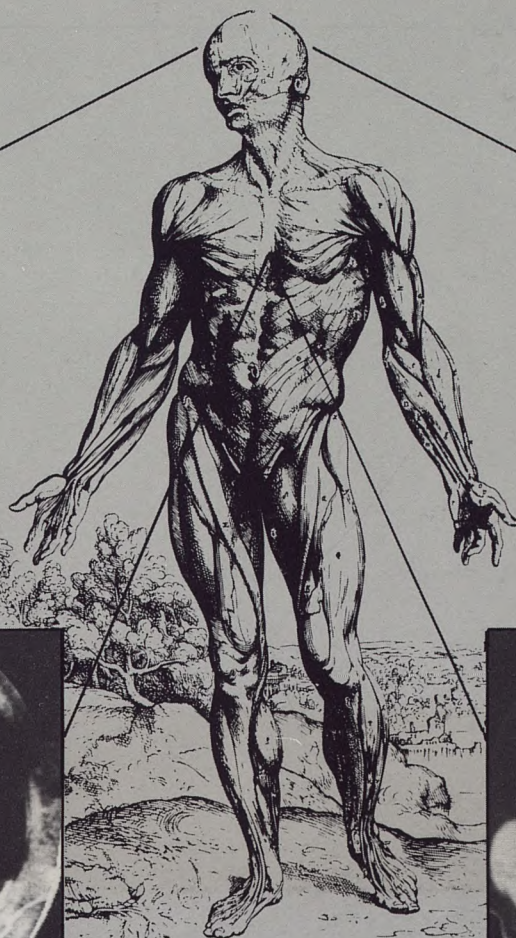
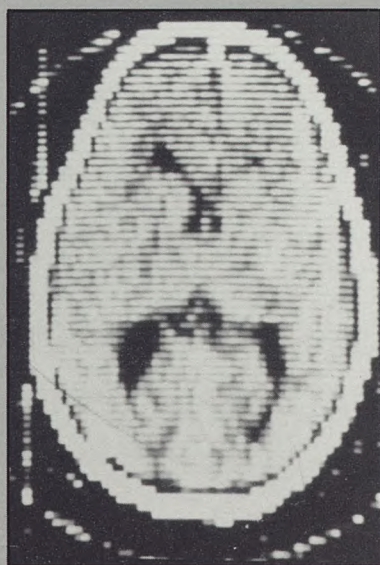
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Indexed

Fall 1985



1975

# CT

1985

## Imaging the Body



# COMPUTED BODY TOMOGRAPHY

## Ten Years and 36,530 Patients Later

by Ria Munoz

A decade has passed since Mallinckrodt Institute of Radiology introduced one of the world's first computed body tomographic units, an imaging device which for the first time in medical history could produce cross-sectional images of the entire body. The nation's leading radiologists considered it the greatest advance since the X-ray was invented and predicted that it would bring about a diagnostic medical revolution.

After extensive clinical investigations at the Institute, the co-chief of CT body imaging at Mallinckrodt, **Stuart S. Sagel, M.D.**, says the early predictions have proven true.

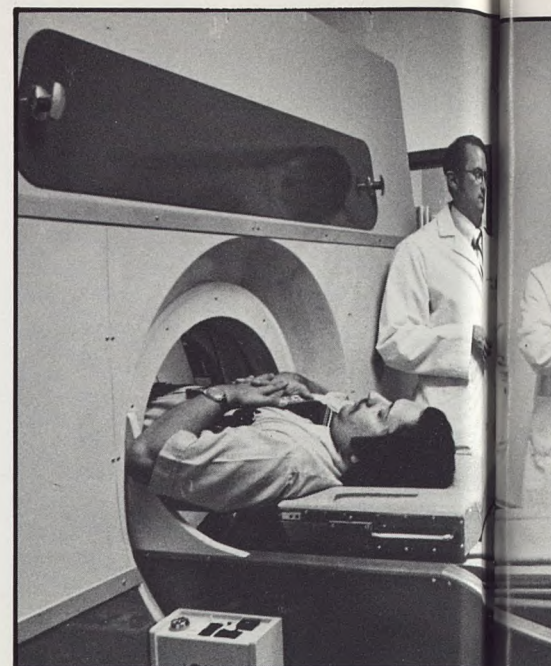
"Even when we first began studies with the CT body scanner, we were able to diagnose conditions that previously required surgery for diagnosis," says Dr. Sagel. "Sometimes we aided the consulting surgeon by showing that the disease was more advanced than anyone expected. At other times, surgery could be prevented because the disease was limited or it was obviously a benign condition. Today the body scanner has largely replaced many other radiological examinations that were either extremely difficult, invasive, or expensive; a lot of thoracic and abdominal angiography (the study of blood vessels with X-ray imaging and the use of contrast material) was replaced by CT," says Dr. Sagel.

With the CT body scanner, it seemed as if the radiologist was able to hinge open a patient's body at any point and

study bones, organs, and the surrounding tissues at that location. The scanner could reveal tumors, abnormal cavities, blood clots, and enlarged organs. And though the device was noninvasive, in many disease conditions it was several times more sensitive than conventional X-ray imaging.

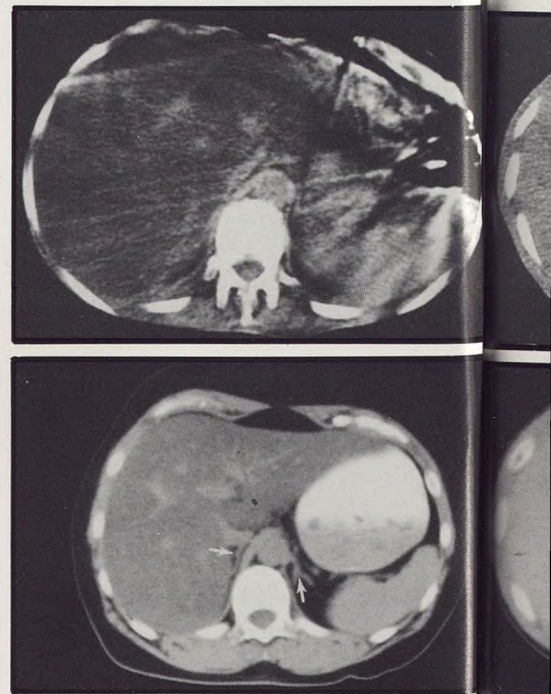
"Though its greatest strength lies in its ability to diagnose and determine the extent of cancer as well as to detect abdominal abscesses, CT imaging has become the procedure of choice in many areas where radiologists used to do myriad radiological investigations. It has become a primary tool in diagnosing abnormalities in areas of the body such as, the mediastinum, larynx, retroperitoneum, and pancreas."

While he was also involved in much of the early testing of the scanner, **Ronald G. Evens, M.D.**, the director of Mallinckrodt Institute, was facing another challenge. There was much controversy over the \$500,000 cost for a CT body scanner, a price which some health care planners called exorbitant and "technology run wild." Dr. Evens, with his strong background in economics, sought to investigate that claim. He emerged as a national authority on the economics of CT imaging and was designated as one of three radiologists asked to help Congress plan guidelines and regulations in the use of CT. In a 1979 investigation analyzing nearly 100 institutions using CT scanners, Dr. Evens found that the new imaging method had cut as much as

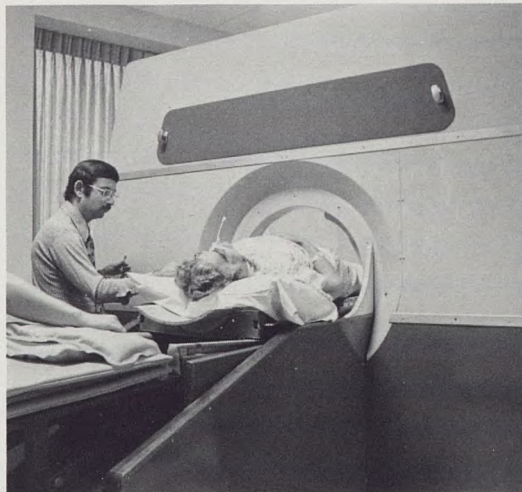
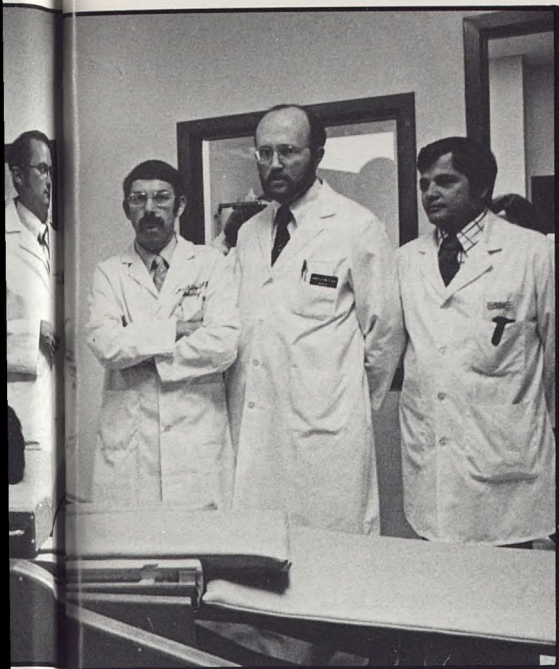


Early investigators, Dr. Ronald G. Evens, the director of Mallinckrodt, left, Drs. Stuart S. Sagel and Robert J. Stanley, and the technical administrator, Armand Diaz, R.N., FASRT, stand beside the new CT body scanner. Technologist Tim Aly lies inside the scanner's circular gantry to demonstrate patient use.

*Fatty Infiltration of the Liver.* A 1975 scan, above left, convincingly demonstrates a fatty liver, but the image quality is degraded by the patient's respiratory motion occurring during the 18-second scan time. Scan from 1985, above right, obtained with 4-second scan time also shows fatty infiltration, but the hepatic parenchyma and vasculature in this second patient are much more clearly depicted, enabling more complete assessment of the liver. In addition, other structures, such as the adrenals (see arrows) are seen much better.

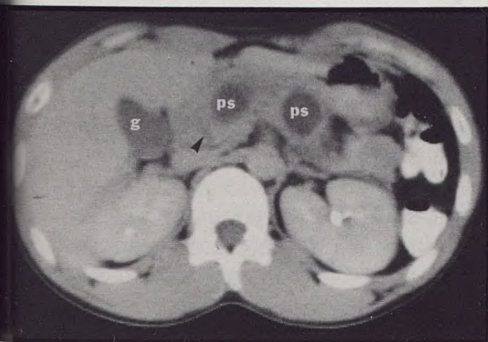
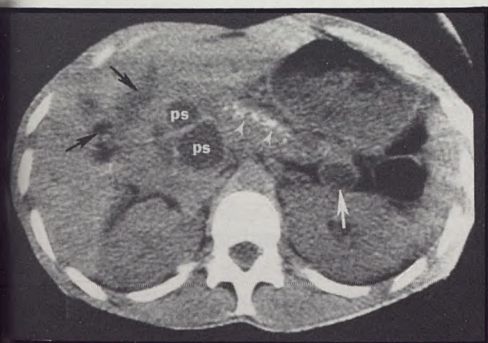






*Dr. Sagel gives an intravenous contrast injection to one of the first patients studied in the CT body scanner.*

*This comparison of CT images revealing pancreatic pseudocysts, again in two different patients, shows that the scanner truly was a diagnostic medical revolution even in its early years. The 1975 scan, below left, portrays adequately all the clinically relevant information. There is calcification (arrowheads) in the body of the pancreas secondary to chronic pancreatitis. Two pseudocysts (ps) in the pancreatic head are obstructing the common bile duct and producing intrahepatic biliary dilation (black arrows). Another pseudocyst (white arrow) is seen in the pancreatic tail. A 1985 scan, below right, which is obtained after the patient has been given contrast material, while demonstrating better contrast and spatial resolution, provides very similar data. Two pseudocysts (ps) are seen in the body of the pancreas. The gallbladder (g) and distal common bile duct (arrowhead) are normal.*



\$450 million from the nation's health bill in the first four years of the scanner's use. This study further stated, "the annual cost of CT units to the nation — approximately \$400 million for the technical cost and slightly over \$600 million for the total charge— represents less than one percent of total health care costs and 5-8% of all diagnostic radiology costs."

The number of patients benefitting from the scanner today proves its importance to medical imaging. "The current equipment has advanced substantially from what we initially used, which enables us to examine a far larger number of patients (at Mallinckrodt Institute)," says Dr. Sagel. "Ten years ago, we were performing six body cases a day. For a similar population in the hospital today, we do an average of 27 cases a day. And there's no study that we do in radiology that has a higher diagnostic yield. In 70 to 80% of our CT studies of the body, important positive findings are detected and close to 40 to 50% of these studies will have a major impact on patient management and clinical care."

In treatment designed to reconstruct the faces of patients suffering from craniofacial abnormalities, the CT scanner has been used to provide three-dimensional images simulating the skin, muscle, and bone surfaces of the skull that will be encountered in surgery. This same technique, developed by **Drs. Michael W. Vannier**, a Mallinckrodt radiologist, and Jeffrey Marsh, a plastic surgeon at Children's Hospital,

has recently been applied in anthropological investigations of the intracranial cavity of fossil skulls, one of which is 30-million-years-old.

The scanner is also a tool used by physicists and radiation therapists in the treatment of cancer. According to **James Purdy, Ph.D.**, the chief of physics in the division of radiation oncology, "With the CT scanner, we are able to localize a tumor and gain accurate details about anatomic structures. This information has opened the door to improved dose calculations in the treatment of cancer with radiation. It has also given us accurate data upon which to base three-dimensional treatment planning." Additionally, cancer specialists currently use the CT scanner to determine the placement of needles and catheters in the treatment of tumors or abscesses, where several years ago complex surgical procedures often were required.

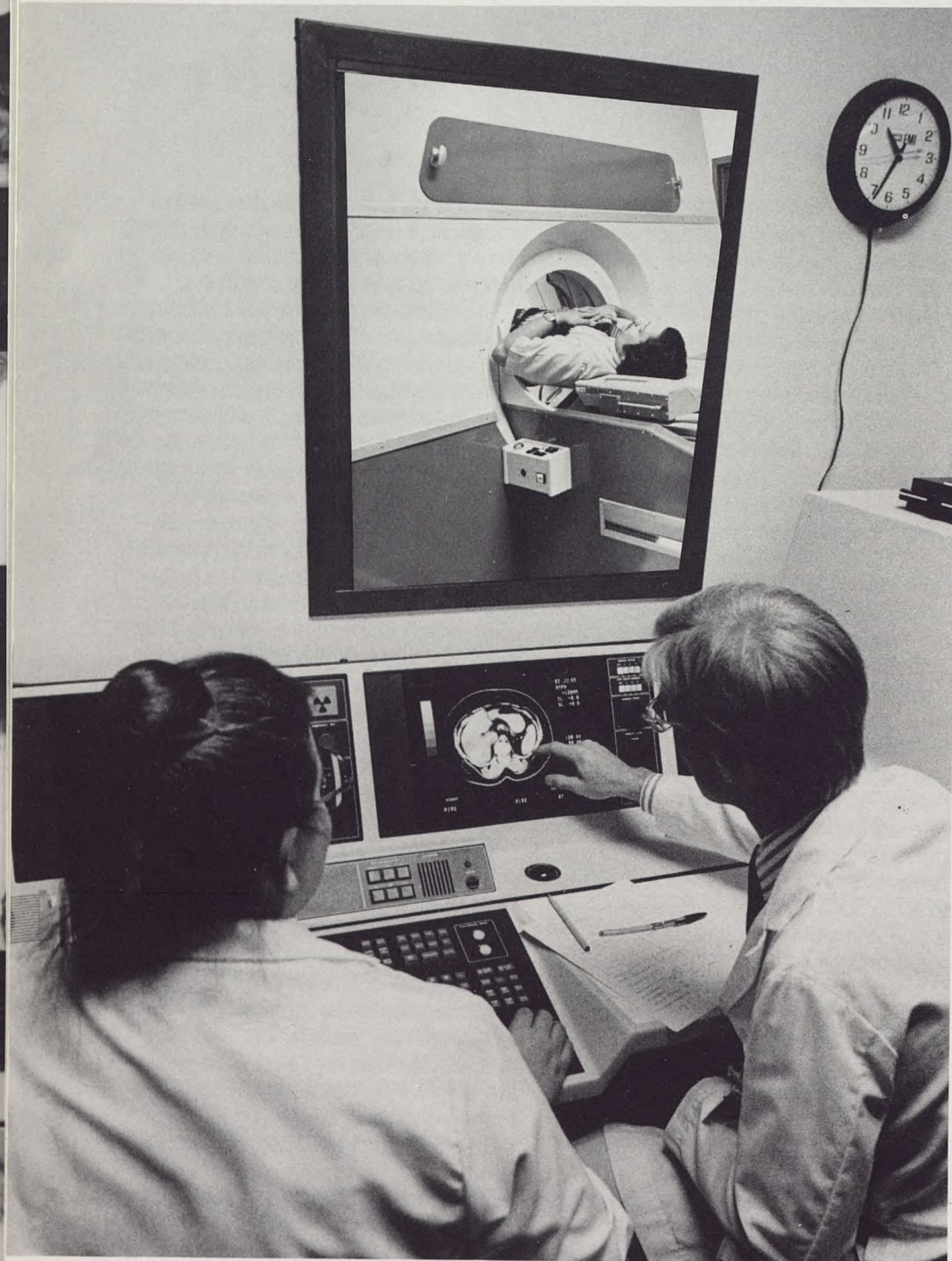
In an effort to share the knowledge gained at Mallinckrodt Institute, members of the staff have published hundreds of scientific papers on CT scanning. In 1981, Drs. Evens, Sagel, and **Robert J. Stanley**, a radiologist who contributed to the Institute's early studies with the scanner and who is now the chairman of radiology at the University of Alabama Medical Center, were among the founding members of the Society of Computed Body Tomography. Today this society is comprised of forty-five physicians and scientists from around the world who are considered eminent authorities in the





To accept delivery of the Institute's first body scanner, an opening was carved out of the wall on the second floor of Mallinckrodt.

One of the Institute's first technologists to operate the CT body scanner, Judy Cortner, R.T., assists Dr. Arthur Bishop, a former resident, during a CT exam. Ms. Cortner is currently an assistant technical supervisor on 2nd X-ray.



And ultimately in 1983, Dr. Sagel with **Drs. Joseph K.T. Lee**, the current co-chief of CT body imaging, and Stanley, edited the publication, **COMPUTED BODY TOMOGRAPHY**, which has been called the first definitive textbook on this imaging technique. With contributions from thirty members of the Mallinckrodt staff, the text discusses anatomy, scanning techniques, clinical applications, and pathologic findings of all the major systems of the body as well as an assessment of the economic impact of CT on patient care. As a result of laudatory reviews received from both medical and radiological journals and publications, the book was the world's best-selling radiology textbook in 1983 and again in 1984.

"When you consider that there are only 20,000 practicing radiologists in this country and sales have reached 16,000, I think it's safe to say that the book is an important text for physicians practicing radiology in the 1980s," says Dr. Sagel.

What does the future hold? According to Dr. Sagel, "CT is now a mature technology. I believe we will probably reach a point where an individual scan will require less than one second to complete as opposed to (the current) 3-5 seconds. This reduction in exposure time could result in the ability to see the heart better." Dr. Lee agrees and commented on cine CT, a new area of research, "In cine CT, 100 pictures are taken rapidly within a three-second exposure period to provide a cross-sectional, cinematic presentation of the living heart."

"There is still a lot for radiologists to learn," says Dr. Lee, who is concerned that few medical imaging experts are exploring the technique's future potential. "It seems as if CT has matured to a stage where some radiologists have become a bit complacent; they think diagnostic imaging with CT is easy. I think that we should try to consolidate what we do know and look into new areas. In the study of the liver, CT is quite accurate in detecting tumors. But, there are instances where we still miss liver metastases. An ideal contrast agent needs to be developed."



## Godfrey Newbold Hounsfield and The Early Investigators

"The million dollar question," says Dr. Lee, "is what will happen to CT in a decade where magnetic resonance imaging (a method relying upon radio frequency wave technology, a powerful magnet, and computers) allows physicians to see the body without radiation." His response to that question: "At the present time, MR imaging can only be used as a problem-solving method. When we have a specific problem interpreting a CT scan such as, 'Is this a blood vessel or is this an abnormal tumor?', then you can use MR imaging to confirm or refute. But, not to replace. CT is still much better in the chest, the neck, the pelvis, and the abdomen."

"Mallinckrodt has grown to become a leading CT center largely as a result of the efforts of Drs. Evens, Sagel, and Stanley," says Dr. Lee. "With the Institute's past being what it is, our future work in CT imaging can only become better."

Keeping a lid on costs in medicine in the eighties is one other concern. According to Dr. Evens, "CT has proven its medical efficacy and its cost-effectiveness, primarily by reducing the number of other diagnostic tests and hospital days per patient."

Comparing CT to newer diagnostic imaging techniques, he adds, "CT will be a tough act to follow because it is currently reducing its (own) costs due to improved patient throughput and reduced equipment cost; while MR imaging and other newer technologies have higher costs because of their equipment and space needs. In order to be cost-effective, MR must reduce hospital days, replace other tests, and be medically effective. These are difficult standards to meet, but they have already been met in selected patient studies."

The future's picture, according to Dr. Evens, "is exciting, and improved patient care is a certainty. CT is well-established and is the 'gold standard' imaging technique for many diseases. As MR imaging and other new technologies challenge this position, the best and most cost-effective diagnostic imaging method will be determined by careful clinical research."

The far reaching advantages of the CT scanner were never envisioned by the man who invented it; much less that his work would be honored with the Nobel Prize in physiology and medicine in 1979.

It all began in 1951 when Hounsfield, an engineer with a background in radar, joined the research staff at Britain's EMI, Ltd., then an international complex made up of more than 80 companies in the electronics, music, and entertainment fields. In years to come, he would move into computer design, a field he considered exciting. He was especially interested in computers capable of recognizing printed characters and he was finding himself drawn to new X-ray technology. That research led him towards the origin of the concept of computed tomographic scanning for medical diagnosis in 1968.

"What Mallinckrodt scientists and clinicians did in the early years of CT scanning was to give Hounsfield information on how to best adapt the new equipment for clinical use," Dr. Evens says. Hounsfield's first scanner, one of which was delivered to Mallinckrodt in 1974, was used exclusively to diagnose brain injuries and tumors. In collaborative research with Institute scientists, he modified the brain scanner so that it could be used to create images of the entire body. The new body scanner arrived at the Institute in September 1975.

"When EMI representatives first approached me with a proposal for a CT prototype, they were unsure of the clinical efficacy of computed body tomography," recalls Dr. Evens.

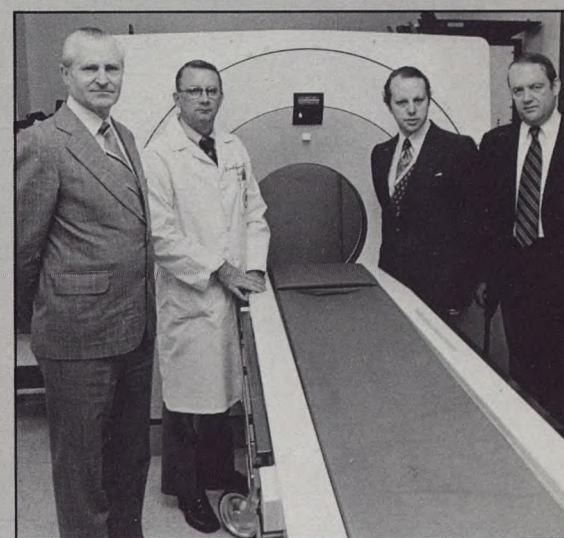
"It was a real feather in Mallinckrodt's cap to be selected as one of the first (radiological centers) in the world to utilize this new piece of equipment. It was obvious to everybody that the CT body scanner was going to be something important," says Dr. Evens.

EMI Limited looked at several hospitals before they decided to choose Mallinckrodt as a recipient of the scanner, and Dr. Evens feels Mallinckrodt was chosen for several reasons.

*continued*



Sir Godfrey Hounsfield, the inventor of the CT scanner and Nobel laureate, right, explains some of the physical principles involved with a phantom to Drs. Evens, Jost, Sagel, and Stanley, left to right.



Pictured at the EMI Scanner 7070, one of a series of EMI scanners following the first EMI body scanner, are left to right, Sir John Read, then the chairman of the board of directors at EMI Limited, Dr. Evens, and EMI representatives, David Steadman and Robert A. Hagglund.



"First of all," he says, "we are a large institution within a well-known medical school."

"Secondly, Mallinckrodt has established an international reputation; if we say something is good or bad, people will believe it. We have demonstrated our ability to publish and do good research at the clinical level. It was important for EMI to have a group which could write about the results of the scanner."

Dr. Evens also feels Mallinckrodt was chosen because of the excellent reputation of Michel M. Ter-Pogossian, Ph.D., the current director of the division of radiation sciences. "We have a group of scientists here with talents and expertise EMI didn't have," Dr. Evens says. "By using our group, they realized they would get good information about how to improve the scanner."

"Finally, Mallinckrodt is a place that has its own group of engineers and technologists who know how to handle expensive equipment. EMI knew they could put the scanner here and not have it constantly breaking down."

Reminiscing on the early studies achieved with the CT body scanner, Dr. Sagel says, "Each scan would take four minutes to reconstruct. In an average

study of the chest, we might get 10 scans and it would take 40 minutes to produce the final images. After finishing this imaging study, we would often spend an additional hour or two going over the anatomy which the scans revealed."

"In this analysis, one of the textbooks we relied upon was an out-of-print, cross-sectional anatomy book written in 1912 by two St. Louis University anatomists, Echyscheimer and Shoemaker. There had been little need until this time for radiologists to understand cross-sectional anatomy," says Dr. Sagel. Mallinckrodt's early CT specialists, according to Dr. Sagel, also studied reports discussing results gained from transverse tomography, a technique developed by Japanese radiation therapists, and performed cadaveric studies, with the aid of Dr. Roy Peterson of the department of anatomy in the Washington University Medical Center, to increase their understanding of the new CT technology.

While these pioneering investigations were going on, many professional people were inquiring about the scanner and numerous patients were referred to Mallinckrodt because of the scanner.

"We discovered that many people

had misconceptions regarding the CT scanner," recalls Dr. Stanley. "Many people came to the Institute thinking they were going to be scanned from head to foot. They thought you would go through this 'bologna slicing machine,' and when the procedure was over, a diagnosis appeared on the screen."

"We had one woman come here from out-of-state with a list of fourteen questions she had prepared herself, ranging from the function of her pituitary to her ovaries. All of this would have required a six-month clinical laboratory work-up in order to make a final diagnosis. This woman, and many others like her, obviously expected more from the scanner than what was then possible."

In addition to its advantages as a noninvasive technique, the CT scanner also gave added information which the physician wasn't even looking for.

"The scanner had on many occasions, in the first years, given us information about something other than the organ we were looking at," Dr. Stanley says. "It might show us that there were gall stones present which we weren't even looking for. It showed us whether there was calcification in the walls of the aorta. It showed us everything that happened to be in that particular slice (of the body); whereas so many other studies zeroed in on just one particular organ system without giving us any other information."

On the role which the imaging technique has played in radiology in general, Dr. Sagel comments, "CT has provided an unexpected advantage for many radiologists: it made us all better interpreters of plain film radiography because it taught us anatomy in better detail than we ever knew before. And the three-dimensional perspective we've gained (from CT) has pointed out relationships that maybe we knew but didn't utilize in practice." Speaking on what CT has brought to his own career in academic radiology, Dr. Sagel says, "When I first began to work with CT, I saw genitourinary problems. I saw abdominal problems. And I saw chest problems. I found that CT had taken me back to the study of medicine as a whole. That was exciting."



A bronze plaque designates the site of MIR's first CT body scanner. Left, Drs. Ronald Evens, Mokhtar Gado, Joseph Lee, and Stuart Sagel.



# Dr. Evens President of Children's Hospital



**Ronald G. Evens, M.D.**, has been named president and chief executive officer of St. Louis Children's Hospital. Announcement of the appointment was made by Andrew E. Newman, chairman of the board of trustees of Children's Hospital.

Since 1971, Dr. Evens has served as the Elizabeth E. Mallinckrodt Professor and head of the department of radiology and director of the Mallinckrodt Institute of Radiology at Washington University School of Medicine. He will continue to hold these positions.

A national leader in radiology, Dr. Evens has also served as president of the Society of Chairmen of Academic Radiology Departments, the Missouri Radiological Society, and as a member of many committees for the American Medical Association, the National Academy of Sciences, and the National Institutes of Health. Evens was the first Missourian to head the medical radiation advisory committee of the U.S. Food and Drug Administration's Bureau of Radiological Health. He also serves on the editorial staffs of four radiological journals.

In 1984, Dr. Evens was given the Distinguished Eagle Scout Award from the National Council, Boy Scouts of America. He is currently a director or trustee of Boatman's Bank in St. Louis, Health Care Network, the Society of Nuclear Medicine, the American Roentgen Ray Society, and the Washington University Medical Center. ■

## Dr. Jost named First Chief of Diagnostic Radiology at Mallinckrodt

**R. Gilbert Jost, M.D.**, has been appointed chief of the division of diagnostic radiology at the Mallinckrodt Institute of Radiology, effective September 1, 1985. This appointment was announced by the director of Mallinckrodt, **Ronald G. Evens, M.D.** The first to occupy this position, Dr. Jost will coordinate Mallinckrodt's diagnostic services including abdominal, cardiac, chest, computer, musculoskeletal, neuroradiology, and pediatric radiology.

On staff at MIR since 1975, Dr. Jost is a professor of radiology and head of the diagnostic radiology computer division. He also serves as a staff radiologist in the chest radiology section and at Barnes and Children's Hospitals.

Dr. Jost is best known for his expertise in the application of computers to radiology and the economic (cost) analysis and utilization of computed tomographic scanners. In 1974, he helped to design at Mallinckrodt the original system used to record and store patient registration and billing information for the radiology department and, in the ensuing decade, has developed MIR's radiology computing facilities into the world's largest and most advanced.

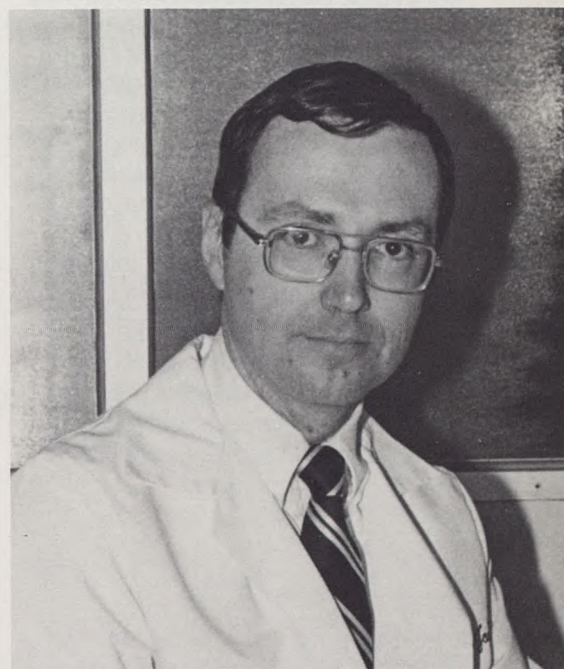
Dr. Jost's commitment to computer networking at Mallinckrodt helped to lay the groundwork for a \$15 million partnership agreement between the Digital Equipment Corporation of Massachusetts and Washington University. Over the next three years, the two will build a campus-wide network of computing and information resources capable of high-speed text transmission and advanced picture communication.

At this time, Mallinckrodt has eight central computers and 175 terminals organized in a modular fashion and linked by direct communication lines, Ethernet coaxial cable, and in some regions by broadband coaxial cable.

Applications include patient monitoring and scheduling, transcription of MIR's 1,000 radiology reports per day, keeping track of X-ray film folders, and department evaluations and management in every area from patient care, research, and teaching programs to the inventory of supplies. Included also is a teleradiology system which transforms X-ray pictures into numerical form by which they can be stored on disk (in digital form); manipulated for image control and quality enhancement; and transmitted electronically across the hospital, or the country. By next year, at least three new control computers and more than 100 new terminals will be added at MIR.

Dr. Jost graduated magna cum laude and first in his department at Harvard University in 1964. He received his medical degree in 1969 from the Yale

*continued*



*R. Gilbert Jost, M.D.*



## ACR Honors Mallinckrodt Staff

University Medical School, where he was editor of the Yale Journal of Biology and Medicine and a fellow in the investigation of medical uses of computers.

As a research associate for the National Institutes of Health, 1970-1972, Dr. Jost worked in the Neural Control Laboratory in Bethesda, Maryland, on projects which included the development of artificial arm prostheses controlled by the motor cortex.

He began a three-year residency at Mallinckrodt in 1972. In 1975, he was chosen as a James Picker Scholar, a program under which the Washington University Medical Center received \$40,000 from the James Picker Foundation over a period of four years to fund Dr. Jost's research, much of which was devoted to the expansion of MIR's computer system.

Dr. Jost is a member of the Radiological Society of North America, the Society of Thoracic Radiology, and the Society of Photo-Optical Instrumentation Engineers, and serves on the Committee on Computers and the Committee on Electronic Communication and Education for the American College of Radiology. The author of over 60 publications, many of which discuss the application of computers to radiology, Dr. Jost is chairman of the Radiology Information System Consortium and has given presentations at more than 50 scientific meetings. ■

Each year, the American College of Radiology recognizes individuals who have advanced the profession through scientific accomplishment, outstanding teaching, and accepted leadership in an area of radiologic specialty. Among those honored at the 62nd annual meeting in September were six former MIR staff, residents, or trainees.

### The 1985 Gold Medal

For distinguished and extraordinary service to the American College of Radiology and the profession for which it stands, a 1985 Gold Medal was awarded to **Juan M. Taveras, M.D.** Formerly director of the Neurological Institute at the Columbia-Presbyterian Medical Center in New York, Dr. Taveras served as the third director of Mallinckrodt Institute of Radiology, and also as head of the department of radiology at the Washington University School of Medicine and radiologist-in-chief at Barnes and Children's Hospitals, from 1969 until 1971. He is currently a professor of radiology at Harvard University and radiologist-in-chief at Massachusetts General Hospital.

### Honorary Fellowship Degree

One of the five honorary fellowship degrees awarded to radiologists who practice outside the United States was given to **Dr. Tu-shan Jung** of Shanghai, China, who came to Mallinckrodt as a China Medical Board Fellow in November 1933.

Arriving only two years after the Institute was founded and nearly four years before the residency training program was begun, Dr. Jung was probably one of Mallinckrodt's earliest foreign visitors and trainees. He worked with **Dr. Sherwood Moore**, the first director of MIR, in a study of intravenous cholecystography which concluded that the administration of glucose orally in the Graham-Cole gallbladder test minimized the patient's

reaction to the "dye," but neither enhanced image quality nor shortened the time required to perform the examination. When this research was published in the February 1935 edition of **The American Journal of Roentgenology and Radium Therapy**, Drs. Jung and Moore wrote that, unlike their contemporaries, they refused to attempt the administration of glucose intravenously in the gallbladder test because of the harmful side effects which might occur.

At the time of his visit to Mallinckrodt, Dr. Jung was an associate in roentgenology at the Peiping Union Medical College in Peiping, China. He was one of many Chinese professionals educated abroad during the 1930s when science and scientific institutions proliferated in China. (Note: From 1927 to 1949, Peking, which means "northern capital," was renamed Peiping because the Nationalist government under the leadership of Chiang Kai-shek established its capital in the city of Nanking, China.)

### 1985 Fellows

**John D. Armstrong, M.D.**, came to MIR as a diagnostic radiology resident in 1967. He was appointed a Mallinckrodt Fellow in Academic Radiology in 1969, and remained on staff the following year as an assistant professor of radiology.

After leaving St. Louis, Dr. Armstrong served for two years in the Medical Corps of the United States Naval Reserve and then moved to Salt Lake City, where for ten years he served on the faculty at the University of Utah Medical Center and as a staff physician at the Veterans Administration Medical Center. Recently he joined the department of radiology at the Mercy Hospital Medical Center in Des Moines, Iowa.

**Johnny Bliznak, M.D.**, began a residency at MIR in 1968, but took a leave of absence from the program after his first year to serve a two-year



## Charles L. Abramson, M.D., elected ACR Fellow

tour of duty in the United States Air Force. He completed his training in radiology in 1973, and remained on staff in MIR's musculoskeletal division for one year. Since 1975, Dr. Bliznak has maintained a private radiological practice in his hometown of Abilene, Texas.

**B. Leonard Holman, M.D.**, completed a one-year residency in radiology at MIR in 1968, and then trained for two years in Mallinckrodt's nuclear medicine program. He is currently a professor of radiology at Harvard University and head of clinical nuclear medicine at Peter Bent Brigham Hospital in Boston.

**Richard Meidinger, M.D.**, was the chief resident of MIR's diagnostic radiology training class of 1970-71. Currently in private radiological practice in Topeka, Kansas, he is associated with the St. Francis Hospital and Medical Center, the Stormont-Vail Regional Medical Center, and the Memorial Hospital, in Topeka, and the Hiawatha Community Hospital in Hiawatha, Kansas.

### ...and the Tradition of Excellence Continues

Mallinckrodt Institute of Radiology has been honored throughout its history with the election of faculty to ACR fellowships. Continuing the tradition are eleven MIR staff members who were named ACR fellows during the past decade.

**Carlos A. Perez, MD.**, 1976

**William H. McAlister, M.D.**, 1976

**Michel M. Ter-Pogossian, Ph.D.**,  
Honorary Fellowship in Physics Degree,  
1976

**Ronald G. Evens, M.D.**, 1977

**Barry A. Siegel, M.D.**, 1981

**Stuart S. Sagel, M.D.**, 1982

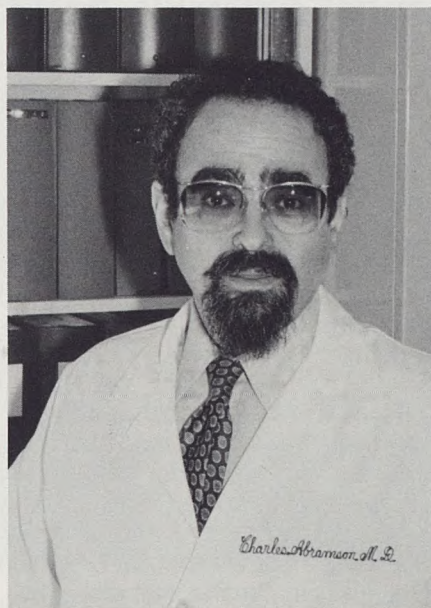
**Louis A. Gilula, M.D.**, 1982

**Bruce L. McClennan, M.D.**, 1983

**G. Leland Melson, M.D.**, 1984

**William A. Murphy, Jr., M.D.**, 1984

**Charles L. Abramson, M.D.**, 1985 ■



**Charles L. Abramson, M.D.**, assistant professor of radiology at MIR, has been elected a 1985 fellow of the American College of Radiology. The degree was conferred at the College's 62nd annual meeting, held September 7-12 in Montreal, Canada.

A well-known St. Louis radiologist, Dr. Abramson maintained a private radiological practice in the metro area from 1971 to 1982. During that time, he served on the clinical teaching staffs at the University of Missouri at Kansas City School of Medicine and also at the Washington University School of Medicine, where he first joined the faculty as a clinical instructor in radiology in 1972. He received his current appointment in January and is on staff at Barnes and Children's Hospitals.

Following many years of service and leadership in professional radiological societies, Dr. Abramson was elected president of the Missouri State Radiological Society in 1983. He has been a member of the Society's board of directors since 1978, and an active participant in the Missouri Medical Association and the St. Louis Medical Society, recently serving for two years on the cost containment and insurance liaison committees of the latter.

At Mallinckrodt, Dr. Abramson specializes in pediatric neuroradiology, a diagnostic program that includes CT scanning, angiography, and myelography. One of only a few such specialists in the Midwest, he received extensive training in this service through a 1983 neuroradiology fellowship at MIR which enabled him to study for six months in Toronto, Canada, at the 700-bed Hospital for Sick Children, the largest pediatric hospital in the Western Hemisphere. There, he trained with Dr. Derek Herwood-Nash, one of the top pediatric neuroradiologists in the world.

Dr. Abramson received his medical degree from the University of Basel in Switzerland in 1964. After completing an internship in medicine at Washington Hospital Center and a one-year residency at Lemuel Shattuck Hospital in Boston, he began his career in diagnostic radiology with residency training at the Tufts-New England Medical Center. From 1969 to 1971, he served as a major in the Army Medical Corps at the Reynolds Army Hospital in Fort Sill, Oklahoma. ■



# A New Beginning

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## 1985 New House Staff

### Diagnostic Radiology

#### 1st Year Postgraduates

**Ted J. Cardoso, M.D.**, earned a bachelor's degree in biology from the University of South Florida in Tampa, his hometown. He completed his medical degree at the Medical College of Virginia, where he was elected a member of AOA. An all-around athlete, Dr. Cardoso jogs, lifts weights, and plays softball, football, and racquetball. He is proficient in Spanish.

**Steven S. Eilenberg, M.D.**, a native of Ohio, received a bachelor's degree in biology from Alfred University in New York, and then completed a master's degree in experimental therapeutics at the State University of New York in Buffalo. During medical school at the George Washington University School of Medicine in Washington, D.C., he was honored with the Goddard Prize in Pharmacology, the Merck Manual Award, and membership in the AOA. His professional memberships also include the Kane King Obstetrical Society and the William Beaumont Medical Society. In his leisure time, Dr. Eilenberg enjoys antique restoration, photography, and bicycling.

**Barbara Garner, M.D.**, was born in Williston, North Dakota, and earned bachelors' degrees in psychology and nursing from the University of North Dakota in Grand Forks. A member of AOA, she received her medical degree from the Washington University School

of Medicine. Dr. Garner and her husband, Steve, an artist and teacher whose areas are painting and screen printing, have three children: Jonathan, 7; Jameson, 2; and Christopher, 2 months.

**Russell W. Norwood, M.D.**, of Bloomington, Illinois, earned bachelors' degrees in biochemistry, biology, and engineering from the University of Illinois at Champaign/Urbana. While attending medical school at Creighton University in Omaha, Nebraska, he received a medical school scholarship and research fellowships from Creighton and from the American Heart Association. A member of AOA, Dr. Norwood was also honored with the Creighton University Achievement award, the Merck Student Award, the Lange Achievement Award, and the Mosby Scholarship Award. His hobbies and special interests range from running, biking, weightlifting, racquetball, and scuba diving to music, photography, and art history.

**Stephen L. Solomon, M.D.**, graduated Phi Beta Kappa and summa cum laude with a bachelor's degree in biochemistry and molecular biology from Northwestern University in Evanston, Illinois. He then returned home to Chicago to attend the University of Chicago Pritzker School of Medicine, where he was a member of AOA and the recipient of the Nels Strandjord Diagnostic Radiology Award. His study of digital chest radiography has been chosen for publication in **Radiology**. In his free time, Dr. Solomon enjoys photography, bicycling, and working with computers. His wife, Pamela, is a dental hygienist.

#### 1st Year Residents

**Bruce L. Bower, M.D.**, holds a bachelor's degree in biology from Gannon University in Erie, Pennsylvania, his home state. After completing his medical education at Hahnemann University in Philadelphia, Dr. Bower, who is a member of AOA, served an internship and residency in general medicine at Cleveland's Case Western Reserve University. For recreation, he runs, lifts weights, and plays tennis and racquetball.

**John T. Engels, M.D.**, was born in Huntington, West Virginia. He received a bachelor's degree in biology from the University of Illinois at Champaign/Urbana, and earned his medical degree at Chicago's Rush Medical College, where he was elected to the AOA. Last year, Dr. Engels served a one-year internship in medicine at Barnes Hospital. His hobbies include hiking, swimming, and movies.

**Amy A. Mosher, M.D.**, is the only native Missourian in her residency training class. At the University of Missouri in Columbia, she obtained a bachelor's degree, cum laude, in physical therapy, and then completed her medical training. A member of the AOA and the American Medical Women's Association, Dr. Mosher served an internship in medicine at Barnes Hospital last year. Her favorite pastimes are ballet dancing, downhill skiing, and murder mysteries.





*New members of the MIR house staff with Dr. Ronald G. Evens, radiologist-in-chief and director of MIR. Seated, left, are Drs. John Wiener, Amy Mosher, Barbara Garner,*

*and Ted Cardoso. Second row, left, Drs. Rich Pacini, Bruce Bower, James Newman, John Engels, Steve Solomon, Steve Eilenberg, and Russell Norwood.*

**James S. Newman, M.D.**, of Lakewood, Ohio, received a bachelor's degree in mathematics from Dartmouth College in Hanover, New Hampshire. He returned to Ohio for his graduate studies, and earned both a Ph.D. in biomedical engineering and a medical degree from Case Western Reserve University in Cleveland. While at Case Western, Dr. Newman was awarded a four-year grant from the National Institute of Health Systems and Integrative Biology to study the use of ultrasound in the diagnosis of liver disease. He is married to Marlene H. Weinstein, M.D., a family practice physician, and enjoys swimming and karate in his spare time.

**Richard J. Pacini, M.D.**, from Elmhurst, Illinois, chose the University of Colorado for his undergraduate work and medical school. He graduated Phi Beta Kappa with a bachelor's degree in molecular biology from the Boulder

campus, and earned his medical degree at the Denver campus. Following medical school, where he was a member of AOA and cited for academic achievement, Dr. Pacini completed an internship in medicine at St. Joseph's Hospital in Denver. He and his wife, Maureen, a certified public accountant, share interests in music, backpacking, and downhill and alpine skiing. They have a six-month-old daughter, Laura.

**Jonathan I. Weiner, M.D.**, completed his undergraduate and medical education in New York City. A native New Yorker, he graduated cum laude with a bachelor's degree in chemistry from Brooklyn College, and attended medical school at the State University of New York, where he was elected to the AOA. Last year, Dr. Wiener, who is a member of the American Chemistry Society and the New York State Medical Association,

served a one-year internship in internal medicine at Montefiore Medical Center in Bronx, New York. He is proficient in Hebrew and French, and enjoys windsurfing, tennis, and camping.

## Radiation Oncology

### 1st Year Resident

**John B. Konefal, M.D.**, a native of New York, graduated Phi Beta Kappa with a bachelor's degree in physical sciences from Colgate University in Hamilton, New York. He completed medical school at the University of Vermont in Burlington, and then served an internship in medicine at the University of Kentucky Medical Center in Lexington. In his spare time, Dr. Konefal enjoys tennis and golf. ■



## Focus on Fellows

### Abdominal

**Alan B. Fein, M.D.**, was born in New York and grew up on Long Island. A Phi Beta Kappa graduate of the University of Rochester in New York, he holds a B.A. in general science and biology. Dr. Fein attended New York City's Columbia University College of Physicians and Surgeons and served an internship and residency in internal medicine at Atlanta's Emory University. He then completed a residency in radiology at Duke University Medical Center, Durham, North Carolina. He is a member of the American College of Physicians and is accredited by the American Board of Internal Medicine and the American Board of Physicians. In his free time, Dr. Fein lifts weights and runs.

**Daniel D. Picus, M.D.**, chief resident 1984-85, completed four years of diagnostic training at Mallinckrodt and is now an instructor and fellow in abdominal radiology.

**Janette L. Worthington, M.D.**, has been appointed an instructor and fellow in abdominal radiology after completing a three year residency in diagnostic radiology at Mallinckrodt.

### Musculoskeletal

**Charles Keith Keyser, M.D.**, chose to do his undergraduate work in his home state of Ohio. He earned a B.A. in history from Oberlin College, then spent the next ten years working in various capacities, including educational salesman and portrait photographer. In 1977, he entered Case Western Reserve University Medical School and after graduation, served his radiology residency at Cleveland Clinic. An expert photographer, Dr. Keyser and his wife, Leona, share interests in gardening and in rearing their three-month-old daughter, Katie Frances.



*Pictured with Dr. Ronald Evens are left, Drs. Charles Keyser and Alan Fein. Standing left, Drs. Paul N. Weiss, Daniel D. Picus, James D. Winthrop, Michael E. Katz, and Janice N. Semenkovich.*

### Neuroradiology

**James D. Winthrop, M.D.**, has been appointed an instructor and fellow in neuroradiology after completing four years of diagnostic training at Mallinckrodt.

**Wanda I. Benitez, M.D.**, first came to Mallinckrodt in December, 1983, as a visiting resident in musculoskeletal radiology. Her studies at MIR, under the supervision of section co-chief **William A. Murphy, Jr., M.D.**, followed undergraduate and medical education and postgraduate training in her native home, Puerto Rico. Born in the commonwealth in Ponce, Dr. Benitez graduated cum laude with a bachelor's degree in biology from the University of Puerto Rico at Mayaguez. In 1979, she completed a medical degree at the University's campus in San Juan, and then served an internship in radiology and a three-year residency in diagnostic radiology at the University Hospital, also in the capital city. Dr. Benitez is married to Eduardo Martinez, M.D., a pneu-

mologist at the DePaul Health Center in St. Louis County. While he enjoys football, volleyball, and other sports, Dr. Benitez prefers listening to popular and classical music, and cooking her favorite Puerto Rican dishes.

### Pediatrics

**Michael E. Katz, M.D.**, after completing three years of diagnostic training at Mallinckrodt, begins a fourth year of residency training in pediatric radiology.

### Nuclear Medicine

**Janice W. Semenkovich, M.D.**, after completing a year of postgraduate training and a three year residency in diagnostic radiology at Mallinckrodt, begins a fellowship in nuclear medicine.

**Paul N. Weiss, M.D.**, begins a fellowship in nuclear medicine following an internship in medicine and a three year residency in diagnostic radiology at Mallinckrodt.



# The Director's Office Reports

## Recent Promotions

**R. Gilbert Jost, M.D.**, to professor of radiology and chief of diagnostic radiology

**Tom R. Miller, M.D.**, to associate professor of radiology

**Michael W. Vannier, M.D.**, to associate professor of radiology

**Christopher J. Moran, M.D.**, to associate professor of clinical radiology

**Charles L. Abramson, M.D.**, to assistant professor of radiology

**Peter T. Fox, M.D.**, to research assistant professor of radiology

**Joel S. Perlmutter, M.D.**, to research assistant professor of radiology

**Paul A. Jerabek, Ph.D.**, to research instructor in radiology

**Fyllis L. Otsuka, Ph.D.**, to research instructor in radiology

## New Staff

**David C. Hardy, M.D.**, assistant professor of radiology

**Mark A. Mintun, M.D.**, assistant professor of radiology

**John G. Rehder, M.D.**, instructor in radiology

**William B. Harms, B.S.**, instructor in radiation physics in radiology

**Eric D. Slessinger, B.S.**, instructor in radiation physics in radiology

**Beatrice A. Carlin, M.D.**, instructor in clinical radiology

**James A. Junker, M.D.**, instructor in clinical radiology

**Balakrishna L. Lokeshwar, Ph.D.**, research associate in cancer biology in radiology

## Off Staff

**Steven J. Adler, M.D.**, after completing four years of diagnostic training in radiology and a one-year fellowship in musculoskeletal radiology, has joined the diagnostic radiology staff at Stanford University Medical Center, Stanford, California.

**William Ganz, M.D.**, has accepted an academic position in the division of nuclear medicine at the University of Miami School of Medicine, after completing two years of training in nuclear medicine.

**Glenn P. Glasgow, Ph.D.**, associate professor of radiation physics in radiology has accepted the positions of professor and head of medical physics at Loyola University School of Medicine in Chicago and head of therapeutic physics at the Edward Hines, Jr. Veterans Administration Hospital, Hines, Illinois.

**Mark A. Green, Ph.D.**, research associate in radiation sciences, has joined the department of radiology at the University of Minnesota in Minneapolis as assistant professor.

**Greg A. Jamroz, M.D.**, completed a one-year fellowship in pediatric radiology and has entered private practice at St. John's Hospital in Washington, Missouri.

**Ronald L. Johnston, Ph.D.**, assistant professor of radiation physics in radiation oncology, has accepted a position as assistant professor in the department of therapeutic radiology at Loyola University Medical Center in Chicago, Illinois.

**Richard A. Koch, M.D.**, completed a one-year fellowship in abdominal radiology and has entered a private practice affiliated with St. Joseph Health Center in St. Charles, Missouri.

**Bharath A.K. Kumar, M.D.**, assistant professor of radiology in nuclear medicine, has accepted the position of medical director of San Gabriel Valley Diagnostic Center in West Covina, California, a new imaging center offering CT, ultrasound, nuclear medicine, and general radiology.

**Bernice S. Law, M.D.**, completed a four-year diagnostic radiology residency and has begun a fellowship in pediatric radiology at Children's Hospital of Los Angeles, California.

**Norbert J. Liebsch, M.D.**, after three years of residency training at MIR, will complete his training in radiation oncology at Mayo Clinic, Rochester, Minnesota.

**James E. Marks, M.D.**, professor of radiology in radiation oncology, has accepted a joint appointment as professor and head of therapeutic radiology at Chicago's Loyola University School of Medicine and at the Edward Hines, Jr. Veterans Administration Hospital, Hines, Illinois.

**William D. Middleton, M.D.**, co-chief resident, 1984-85, completed four years of diagnostic radiology training and has begun a fellowship in digital imaging at Milwaukee County Medical Complex in Milwaukee, Wisconsin.

**David J. Monyak, M.D.**, chief resident in radiation oncology, 1984-85, completed four years of training in radiation oncology and has joined the radiation therapy staff of the University of Minnesota Hospitals in Minneapolis.

**Dan M. Mulholland, M.D.**, has entered private practice at Fairmont Community Hospital in Fairmont, Minnesota, after completing four years of diagnostic training.

**Arthur L. Mulick, M.D.**, completed a one-year fellowship in nuclear medicine and has joined Delta Radiology, a private practice radiology group affiliated with East Jefferson General Hospital in Metairie, Louisiana.

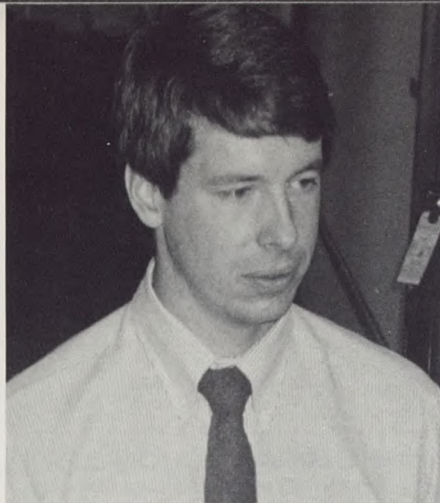
**J. Patton Neeley, M.D.**, has joined a private practice group, Diagnostic Imaging, in Idaho Falls, Idaho, after completing four years of diagnostic training.

**Mark Schwimmer, M.D.**, completed a three-year diagnostic residency and has begun a fellowship in CT and ultrasound at New York University School of Medicine, New York City.

**Andrew van der Vliet, M.D.**, completed a one-year fellowship in abdominal radiology and has entered a hospital-based private practice in Victoria, Australia.

**Patrick M. Vogel, M.D.**, after completing his first year of residency training in diagnostic radiology, will continue his residency at the University of California at San Francisco. ■





John Hart Niemeyer, M.D., chief resident

Chief resident **John Hart Niemeyer, M.D.**, entered the Washington University School of Medicine in 1978 planning to become a surgeon. Though his father is a radiologist in Akron, Ohio, the younger Niemeyer didn't switch to the specialty until after his radiology service rotation during medical school, when he began to realize how diverse the field of radiology is today and how much opportunity it offers for the patient contact he wants in his own career.

As he explains, "You have to use everything you learned in medical school to practice radiology today. With CT scanning, ultrasound, the interventional and angiographic techniques, magnetic resonance imaging, ... really all the radiological procedures, you're exposed to many different medical specialties—the whole gamut of health care. And, as a radiologist, you get to be involved in the diagnostic portion of a patient's workup, which is what's most interesting and rewarding to me."

Although radiology is the most competitive field for medical students seeking residencies, Dr. Niemeyer was determined to enter the best program he could find. After interviewing at other hospitals, Mallinckrodt Institute became his first choice.

In getting the appointment at MIR, Dr. Niemeyer's educational record served him well. He is a Phi Beta Kappa graduate of the University of Michigan, where he was awarded bachelor's degrees in physiology and zoology with highest honors. During medical school, he received Washington University's Alfred Goldman Book Prize in Diseases of the Chest.

Though time-consuming, Dr. Niemeyer's duties as chief resident give him valuable experience in dealing with staff members, administrators, and other residents. He works closely with co-chief **Ken Rholl, M.D.**, with whom

# Profiles of the Chiefs

## Diagnostic Radiology

he shares a ride to work and hours of free time engaged in long distance running, as well as an office at MIR. After the program ends in June, his professional goals include establishing a private radiological practice and further pursuing his special interest in interventional radiology.

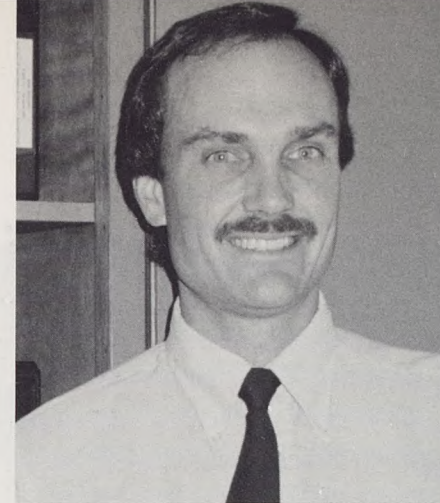
Dr. Niemeyer and his wife Maureen, who was a registered nurse at Children's Hospital until the birth of their second child, like living in St. Louis. They feel the metro area is a good place to raise their children, Matthew, 4, and Katie, 1, and agree that the Midwestern locale provides many opportunities for outdoor activities, of which their favorites are snow skiing, golf, camping, and canoeing.

St. Louis' central location also lets the Niemeysers indulge in their one obsession. Self-confessed, "rabid Michigan football fans," they try to attend at least one Michigan game a year.

Sharing resident leadership responsibilities with Dr. Niemeyer is co-chief **Kenneth S. Rholl, M.D.**, whose calm, easy-going manner often belies his genuine concern for fellow residents.

Of the chief and co-chief jobs, Dr. Rholl says, "Our real task as representatives of the residents is to make the year run smoothly. We listen to suggestions and try to help the trainees and staff with any problems they might be having. Although there are no written rules for us, we try to work together and coordinate our efforts to meet the goals we've set."

As co-chief, Dr. Rholl is responsible for scheduling CPR courses, student technologists lectures, cases of the week presentations, and, with Dr. Niemeyer, the call schedule or resident rotation schedule. Recently the two have also been interviewing prospective students for the MIR radiology



Kenneth S. Rholl, M.D., co-chief resident

program—a process that requires about an hour each day, for several months.

Like Niemeyer, Dr. Rholl is the son of a radiologist and believes that physicians specializing in radiology choose the field for its diversity.

He explains, "The fact that you deal with so many fields means you're not really limited as you are in other specializations. And because you need to know a lot about different fields, being a radiologist requires that a person have a fairly well-rounded medical background."

Dr. Rholl graduated summa cum laude with a bachelor's degree in chemistry from Gustavus Adolphus College in Minnesota, his home state. He received his medical degree from the University of Minnesota Medical School, and then chose Mallinckrodt for his residency because of the high quality of the program. A Midwesterner at heart, he also knew that he would feel at home in St. Louis, and he has not been disappointed.

While he has not yet decided between a career in academic radiology and private practice, Dr. Rholl does have a special interest in interventional radiology. Next year, he will study interventional radiologic techniques with noted authority Barry Katzen, M.D., in Alexandria, Virginia, as part of a one-year MIR fellowship.

A serious runner, Dr. Rholl hopes to one day participate in some of the larger marathons across the country. Though this goal may have to wait until he completes his residency and fellowship, Dr. Rholl, a bachelor, finds time now to run in local marathons and to enjoy windsurfing and tennis.



## Radiation

A grandmother's dream that all of her children would be educated in the United States set the pace for the academic career of assistant chief resident **William J. Pao, M.D.**

Although traditionally his family had worked as merchants and businessmen in Hong Kong, Dr. Pao and many other members of his generation chose to pursue careers in the sciences. In 1976, Dr. Pao moved to the U.S. and began undergraduate studies in biology and chemistry at Marquette University in Milwaukee. He left the program after his third year, before earning a degree, to begin medical school at the Medical College of Wisconsin in Milwaukee.

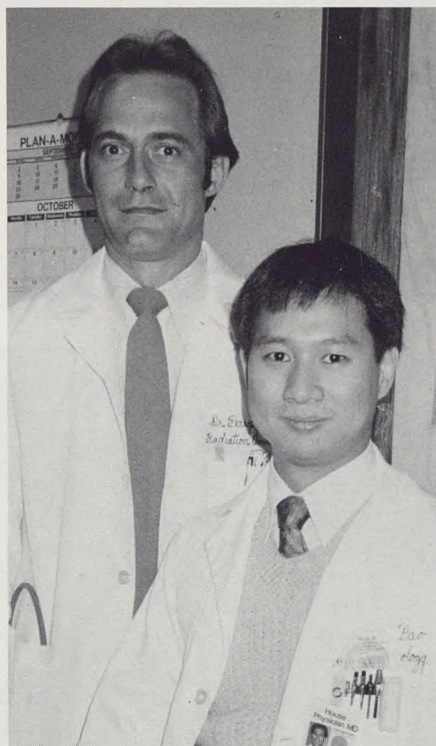
During medical school, Dr. Pao completed a summer oncology fellowship, and the clinical experience proved so interesting and rewarding that he soon made the decision to train in radiation therapy.

He explains, "I really like working with patients; taking care of people. Working in an oncology department is ideal for this kind of physician involvement."

As assistant chief of the oncology residency program, Dr. Pao has opportunities to impress the philosophy of patient care upon resident students. In addition to assisting Dr. Grigsby, he schedules staff members and guest lecturers to speak at weekly conferences and at about 40 didactic lectures that will be held this year.

Reflecting upon these responsibilities, he says, "It is important that our medical students understand the need for personalized patient care. This idea may not have been emphasized in their medical training, but, at MIR, they will learn that our oncologists are concerned about improving the quality of life for each individual patient."

Outgoing and sociable, Dr. Pao likes the Midwestern hospitality he has encountered in St. Louis. Friends here introduced him to his wife, Lily, an accounting student who is also from Hong Kong. Married a little over a year,



*Perry W. Grigsby, M.D., left, and William J. Pao, M.D., chief and co-chief residents, radiation oncology*

the Paos live in South St. Louis, and try to get to nearby parks occasionally to enjoy a favorite pastime, fishing.

Content with his profession and life in St. Louis, Dr. Pao has not forgotten his roots in Hong Kong. Several times each year he travels across the country to meet with a Toronto obstetrician, a Hong Kong barrister, or any one of the several other childhood friends with whom he has remained in contact for over twenty years. ■

**Perry W. Grigsby, M.D.**, the chief resident in radiation oncology, has accomplished much in the years since he left his family's farm in Cadiz, Kentucky, to pursue education at the University of Kentucky. He completed a bachelor of science degree in zoology in 1974, and four years later received a master's degree in medical radiological physics.

Remaining at the University, Dr. Grigsby entered medical school, where he quickly established a standard of excellence. In 1981, he was awarded \$6,700 from the American Cancer Society to study the **Improved Therapeutic Ratio With the Combination of Radioprotector and**

## Oncology

**Radiosensitizers in an Experimental Mouse Tumor.** The following year, he was honored as outstanding senior student in radiation oncology.

At MIR, Dr. Grigsby has continued to be recognized for his efforts in his field. He recently completed a Regular Clinical Fellowship, awarded by the American Cancer Society, and is the recipient of a 1984/85 National Research Service Award given by the National Institutes of Health.

Of his profession, Dr. Grigsby says, "The thing I most enjoy in radiation oncology is the therapeutic aspect and one-on-one relationship with a patient. This relationship is especially important in radiation oncology because many patients do not understand cancer. They're afraid of the word. With a caring physician and appropriate explanations, our patients can maintain hope for the future."

Dr. Grigsby's friendly personality is an asset for the job as chief resident, which requires that he assist residents in all phases of training—from orienting new students to the program to helping residents prepare meaningful case presentations. He also coordinates rotation schedules for the ten residents in the division, and acts as a liaison between radiation oncology and chief residents on other services, an important role in view of the multidisciplinary nature of cancer therapy.

A member of several professional organizations, including the American College of Radiology, the American Society for Therapeutic Radiology and Oncology, and the Radiation Research Society, Dr. Grigsby has made presentations at nine national scientific meetings. Additionally, he has authored sixteen research papers.

Handling the roles of husband and father of three children rounds out the life of Dr. Grigsby. He is an active member of Kirkwood Presbyterian Church, and among his list of interests are practical hobbies such as woodworking and refinishing furniture. ■



# MEDICINE

## Putting the heat on cancer cells

*The following article is reprinted with permission from the St. Louis Globe-Democrat.*

### Hyperthermia killing tumors in local therapy

**By Carolyn Callison**  
St. Louis Globe-Democrat

**O**fficials at the Mallinckrodt Institute of Radiology have high hopes that a new technique may prove to be as fatal to malignant tumors as water was to Oz's Wicked Witch of the West.

But unlike Dorothy, who unwittingly melted the wicked witch with water, doctors are "melting" or "shrinking" tumors with applications of high heat.

The process is called hyperthermia. Doctors say that—especially when it is combined with moderate radiation therapy—the treatment has eliminated some types of malignant tumors.

About 60 scientists and physicians from around the world attended a symposium Sept. 12-14 on the treatment at the institute, in the Washington University Medical Center complex.

"We were one of the first five or 10 institutions in the country to begin work on hyperthermia," said Dr. Carlos Perez, who initiated the program at Mallinckrodt.

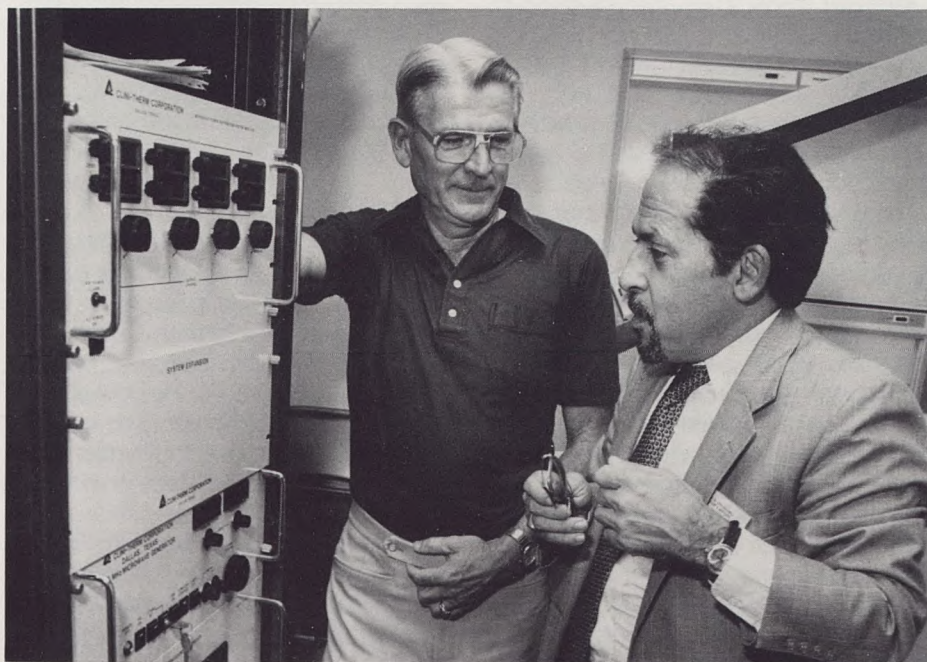
PEREZ, DIRECTOR of the division of radiation oncology at Mallinckrodt, said that so far, results have been "fabulous in terms of the heat killing cancer cells."

Hyperthermia generally is used in



**Globe-Democrat/Rick Stankoven**

William L. Jenkins of Granite City is treated for cancer at the Mallinckrodt Institute of Radiology.



**Globe-Democrat/Rick Stankoven**

Hyperthermia has been used to treat Carroll Rench of Greenville, Ill., left, by his doctor, Bahman Emami.



conjunction with radiation therapy, and Perez said the combination has proven to be successful for 70 percent to 80 percent of the patients. Radiation alone works only in 30 percent to 40 percent of the tumors, and hyperthermia alone is effective in 10 percent of the cases.

They are not sure exactly why the statistics are better when radiation and hyperthermia team up to attack the tumors, but they believe one reason may be because they each damage different types of cells within the tumor.

"Radiation is most damaging to cells that contain oxygen, while hyperthermia does the most harm to cells with a low oxygen supply," according to a patient information brochure. "If radiation and hyperthermia are combined, both kinds of tumor cells will be killed."

DOCTORS EXPLAINED that when used shortly after a radiation treatment, hyperthermia further damages the already weakened cells.

"If a patient receives a radiation treatment and, half an hour later, they receive a hyperthermia treatment, the cancer cells that ordinarily would have been able to recover from the radiation damage will not be able to do so and will die," the brochure explained.

So far, the method has proven effective in combating head and neck tumors, and breast and skin cancer. But doctors warn that the percentages do not reflect a survival rate. That is because until recent Food and Drug Administration approval of the technique, most of the patients were

being treated for advanced cases of cancer.

Even in those cases, "it certainly helped reduce their pain and discomfort," said Dr. Bahman Emami, clinical director of the hyperthermia program at Mallinckrodt.

THE CONCEPT ITSELF is not new, but the technology is, Perez explained.

As early as 400 B.C., Hippocrates reported attempting to treat tumors with heat, and in the 1800s, doctors reported that tumors shrank in some cancer patients who experienced very high temperatures.

But only within the last two decades has the equipment evolved enough to be able to regulate the heat efficiently enough for treatment, Perez explained.

Hyperthermia works by increasing the temperature of the tumor to 110 to 114 degrees, while keeping the surrounding normal tissue cool. Microwaves, ultrasound or radiofrequency electric fields can be used to reach the proper temperature.

Depending on the type and location of tumor, treatments are administered three ways.

WITH SUPERFICIAL hyperthermia, the area to be treated is first numbed with a local anesthetic. Catheters equipped with temperature probes are inserted to keep constant track of the temperature. The hyperthermia machine is then connected to the catheters for the treatment, which lasts from 30 to 60 minutes.

If the doctor determines that the tumor should come in direct contact with the heat, "interstitial" or internal treatments are used. In that method, the catheters are used as heat con-

ductors, acting as "antennas" which take heat directly to the tumor, according to a patient brochure.

For internal tumors, doctors prescribe "deep-seated" hyperthermia treatments in which patients are placed in a computer-operated machine that uses microwaves to heat the tumor.

Carroll Rench of Greenville, Ill., already had survived a bout with lung cancer five years ago when his doctor diagnosed a malignant tumor on his back and recommended him for the superficial method of treatment.

BUT THAT WAS in June. Today, a CAT (computerized tomographic) scan shows that after 25 radiation treatments and 10 hyperthermia treatments, Rench's tumor is gone.

Rench, 52, said he is "very pleased with what's taken place," but past experience has taught him a valuable lesson.

"I'm just going to take every day as it comes," he said. "I had cancer before and the doctor had said if you go five years without it coming back, you're OK, but even after five years, it came back."

Another patient, whose seventh and final treatment coincided with the last day of the symposium, was looking forward to life without the tumor that had developed on the left side of his face.

William Jenkins, 81, of Granite City, said that although the treatment was "a little uncomfortable at times," he is "tickled to death with the results."

Like Rench, Jenkins noted that the worst thing about the treatment was "having to lie still for an hour." ■



## News Conference Builds Public Awareness of MIR Hyperthermia

While achieving its stated goal of educating medical professionals from around the world in the theories and clinical uses of hyperthermia, the Hyperthermia Symposium at MIR served a dual purpose in that it also enabled the St. Louis-area public to learn about this new and relatively little-known cancer treatment.

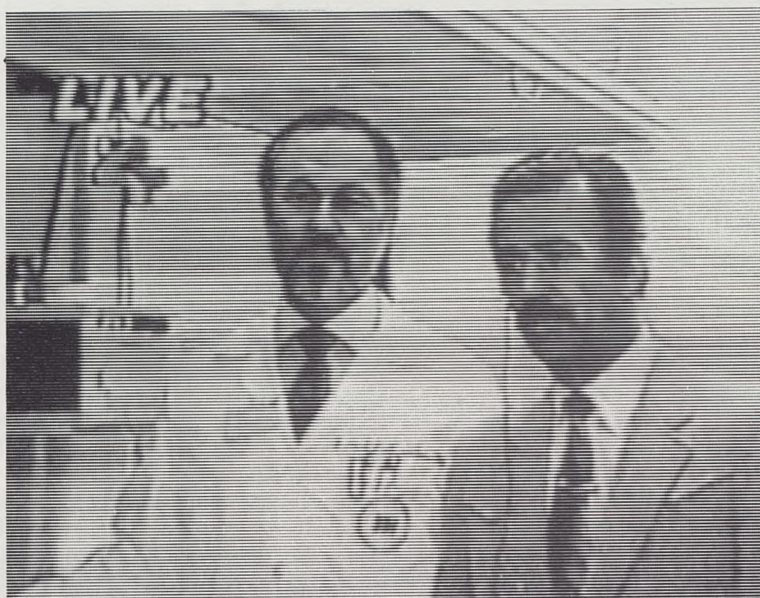
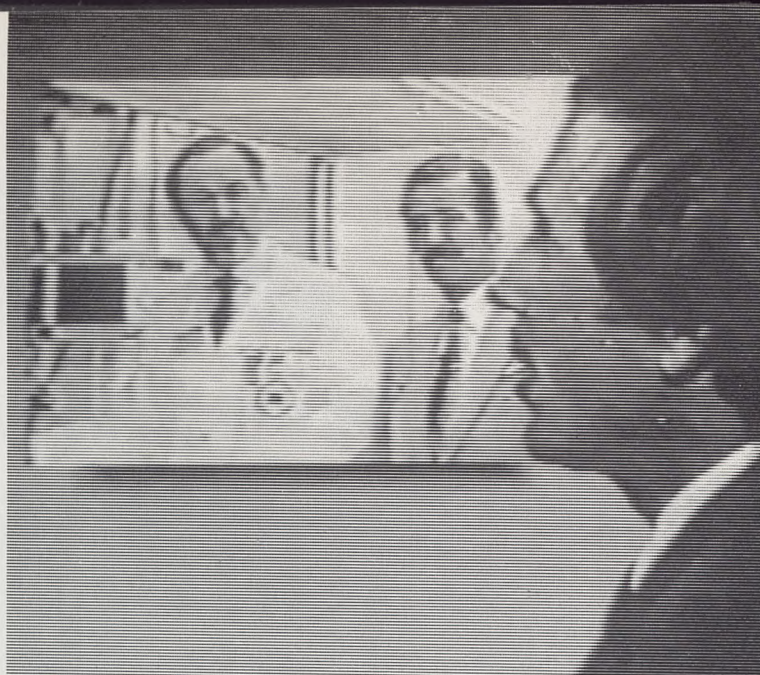
Local news reporters Al Wiman, of KMOX-TV, Kathy Leonard, of KSDK-TV, and John Schieszer, of KPLR-TV, produced television reports for their evening broadcasts at the symposium, including live interviews of **Drs. Carlos Perez** and **Gilbert Nussbaum** and former patients, and footage of an actual hyperthermia treatment in process. Lisa Allen, of KTVI-TV, produced a special live interview of former patient Mr. Carroll Rench, of Greenville, Illinois, and symposium chairman, **Bahman Emami, M.D.**, who also participated in an informative 1½ hour interview on KXOK-AM which offered radio listeners an opportunity to call in questions.

Both daily newspapers gave lengthy coverage to the symposium, and public service announcements about the event were aired on KMOX-AM.

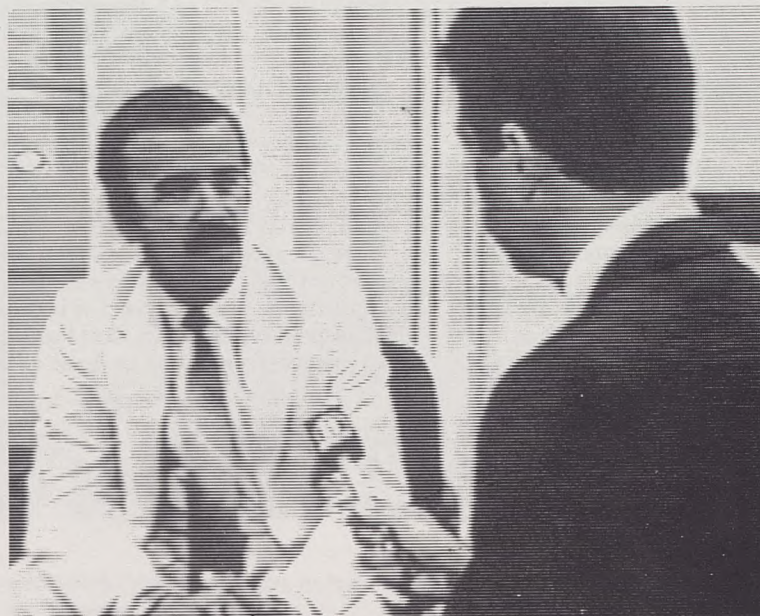
The positive consequence of this widespread coverage in the metro area has been a continuing stream of public inquiries from individuals who hope that hyperthermia can help them or someone they know. Already several people have been identified as likely candidates for the treatment. ■

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*John Schieszer, KPLR-TV medical reporter, interviews Dr. Perez in the MIR Hyperthermia Treatment Center*



*Drs. Nussbaum and Perez discuss hyperthermia techniques in a live interview with Al Wiman, KMOX-TV medical-science reporter*





# THE HELIOS

Cancers of the pelvis and abdomen have been targeted for battle by scientists at Mallinckrodt's Hyperthermia Treatment and Research Center. The researchers may have the edge this time because a new weapon—the Helios—has been added to their arsenal of heating devices used to destroy cancer cells.

Helios is a multiple-beam ultrasound heating unit designed to deliver thermotherapy to tumors located deep within the body. The developers, Varian Associates of Palo Alto, California, specially chose MIR to receive the first and only Helios because the unique Hyperthermia Center here is equipped to perform the necessary preliminary investigations.

During the year ahead, a research team led by **Gilbert H. Nussbaum, Ph.D.**, associate professor of radiation physics in radiation oncology and senior physicist at the Hyperthermia Center, will evaluate the physical potential of the new equipment. Assisted by **Leonid Leybovich, B.S.**, and **William Straube, B.S.**, Dr. Nussbaum will conduct initial investigations using phantoms that have the same acoustical properties as human tissue to determine Helios' uses and limitations. The team will characterize the methods for best heating tumors at different depths and locations within the body, and working closely with **Carlos A. Perez, M.D.**, director of the division of radiation oncology, and **Bahman Emami, M.D.**, clinical director of the Hyperthermia Center, hope to begin selected clinical applications of Helios thermotherapy in six months to one year.

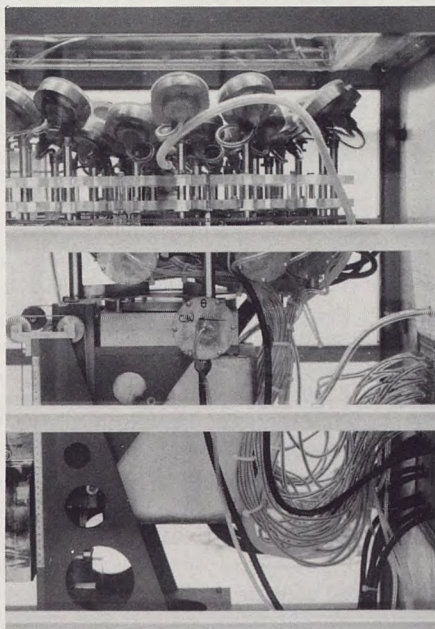
The objective of the Helios system is to safely deposit a therapeutic level of heating power at depths of up to 15 cm. It represents a tremendous potential for increasing the effectiveness of hyperthermia as a cancer treatment modality since most malignancies at depths greater than 5 cm. have been technically inaccessible to existing hyperthermia applicators.

Filling an entire laboratory, Helios



*Physicist Gilbert Nussbaum, Ph.D., measures the beam intensity produced by the Helios during an initial experiment*

Photo by Leslie MacConnel-Clubbs



*The transducer array-applicator system of the Helios multi-beam ultrasound unit as seen through the lucite window of the water tank.*

consists of an applicator system, a thermometry system, and an imaging system.

The applicator (or heating) system is made up of an array of 30 focused ultrasound transducers, arranged on four concentric rings. It has a number of special features that permit shaping of the heating distribution in accordance with the size, shape, and depth of a particular tumor. These capabilities, which are unique to Helios, include: adjustment of the heating field diameter from 1.0 to 10 cm. by shifting the position of the ultrasound elements; computer-controlled, independent adjustment of driving power to the respective transducer rings, and to individual transducers themselves; and mechanical adjustment of the entire transducer array, which is capable of horizontal and vertical movement, as well as rotation.

Helios' thermometry system consists of 30 channels (thermometers) and is expandable to a maximum of 100 channels, all of which can be read simultaneously by the computer. These thermometers are strategically placed during hyperthermia treatment to allow temperature monitoring of tissue which is most likely to be affected by the heating process.

The imaging system, located at the center of the transducer array, is an ultrasonic water-path sector scanner. Its incorporation into the multiple-beam unit is designed to facilitate appropriate placement of the tumor within the heating field and to permit more precise placement of thermometers within the treatment volume.

As an anti-cancer therapy, the Helios will be most effective against tumors in the fatty and muscular tissue of the breast, pelvis, and abdomen, where sound waves have less chance of being deflected by air or absorbed by bone. With deep-seated tumors of the pelvis and abdomen currently accounting for 40% of all cancer deaths, the potential benefits of this new technology are profound. ■



# NEWS

## Conferences/Symposia/ Meetings/Seminars/Courses

**Patrick R.M. Thomas, M.B., B.S.**, presented a workshop on "Risk Benefit Ratio" in Baltimore, Maryland, on Sept. 4-6.

**Stuart S. Sagel, M.D.**, gave four separate talks on various aspects of "CT of the Thorax" at the 3rd Annual Emory University Summer Imaging Course, at Kiawah Island, South Carolina, on Aug. 12-16. He also presented "CT in the Evaluation of Bronchogenic Carcinoma" at the 4th World Conference on Lung Cancer, held in Toronto, Canada, on Aug. 25-28, and "CT of the Mediastinum," in a series of five lectures for the course, Chest Disease: 1985, at Harvard Medical School, in Boston, on Sept. 9-12.

**Joseph L. Roti Roti, Ph.D.**, in poster sessions and talks, made the following presentations: "Visualization of HeLa Nucleoids by Fluorescence Microscopy," at an editorial workshop of the Radiation Research Society, in Los Angeles, California, on May 5-9; "The Nuclear Matrix from Heat-Shocked Cells is Resistant to RNase-induced Disruption," at the Cold Spring Harbor Heat Shock meeting, in New York, on Aug. 28-Sept. 1; and an "Advanced Course in Flow Cytometry Analysis and Fluorescence Activated Cell Sorting," which was sponsored by the Cancer Research Association Organizing Committee, plus a lecture on "Methods for Cell Cycle Analysis," at the 1985 Villejuif, Paris, France, on Sept. 9-13.

**Todd H. Wasserman, M.D.**, spoke on "Late Effects of Chemotherapy/Radiotherapy from Radiation Therapy Oncology Group and Mallinckrodt Institute of Radiology Studies," at the National Cancer Institutes Meeting on Late Effects, Baltimore, Maryland, held on Sept. 4-6, and attended the International Symposium on Labelled and Unlabelled Antibodies in Cancer Diagnosis and Therapy, in Baltimore, on Sept. 12-13.

**Carlos A. Perez, M.D.**, gave presentations on: "Impact of Local Control in the Survival of Patients with Carcinoma of the Prostate" and "Impact of Tumor Control on Survival in Carcinoma of the Lung" at the Third Rome International Symposium on the Challenge of Local Control and Its Impact on Survival, held in Rome, Italy, on May 12-17; "Clinical Experience with Localized Hyperthermia and Irradiation," with John L. Meyer, M.D., at the 4th International Symposium on Hyperthermic Oncology, Arhus, Denmark, Jul. 2-6; "Dose-Tumor Response and Survival Studies in Radiation Therapy of Non-Small Cell Carcinoma of the Lung," at the Fourth World Conference on Lung Cancer, Toronto, Canada, on Aug. 25-30; "Radiation Therapy of Carcinoma of the Uterine Cervix," "Radiation Therapy in Carcinoma of the Endometrium," and "Definitive Radiotherapy in the Management of Prostatic Carcinoma" at the Rambam Medical Center, Haifa, Israel, on Aug. 31-Sept. 7; and "Conservative Management of Early Carcinoma of the Breast," "Radiation Therapy in Carcinoma of the Prostate," "Radiation Therapy in the Treatment of Carcinoma of the Lung," and "Radiation Therapy in the Management of Carcinoma of the Rectosigmoid" for the Congresos Integrados de Cancerlogia, Cali, Colombia, on Sept. 18-21.

**Joseph K.T. Lee, M.D.**, serving as a faculty member, spoke on: "MRI of the Pancreas" at the American Gastroenterological Association Postgraduate Course, held in New York, on May 11. He presented a series of talks, as a faculty member, for each of the following meetings: the 6th Annual Symposium on Diagnostic Imaging, at Brown University and Rhode Island Hospital, Newport, Aug. 12-15; the Masters International Diagnostic Radiology Conference, Baden-Baden, West Germany, Sept. 8-13; and the Abdominal Imaging Seminar, held at Georgetown University, Sept. 19-22.

**Michael W. Vannier, M.D.**, participated in symposiums and meetings and discussed: "Craniosynostosis and the Cranial Base," with Jeffrey L. Marsh, M.D., "The Osseous Anatomy of Unilateral Coronal Synostosis," with J.L. Marsh, M.D., and **Mokhtar Gado,**

**M.D.**, and "In Vivo Anatomy of Mandibulofacial Dysostosis (Treacher Collins Syndrome)," with J.L. Marsh, M.D., and Scott E. Celin, M.D., at the First International Congress for Craniofacial Surgery, La Napoule, France, Sept. 7; "Clinical Applications of 3-D Imaging" at meetings of the Houston Radiological Society and St. Joseph's Hospital, Houston, on Sept. 23; and "Wrist Kinematic Analysis Using 6 Degree of Freedom Digitizer," with S.E. Logan, S.J. Bresina, and P.M. Weeks, "Statistical Assessment of MR Image Classification Techniques," with L.D. Schertz, **Mokhtar Gado, M.D.**, and R.L. Butterfield, "3-D Display in Medicine," while serving as session chairman, and "Clinical Application of Computer Graphics in Surgery," with J.L. Marsh, M.D., **Robert H. Knapp, B.M.R.T.**, and **Carolyn Offlutt, R.T.B.A.**, for the IEEE/EMBS 1985 meeting on Frontiers of Engineering and Computing in Health Care, Chicago, Sept. 27-30.

**Mokhtar Gado, M.D.**, made the following presentations: "Intracranial Anatomic-Pathologic Correlation (Functional Anatomy)," "Plain Film-CT-MRI Diagnosis of Disc Disease," and "Plain Film-CT-MRI Diagnosis of Spinal Stenosis and Lateral Recess Disease" at the 6th Annual Symposium on Diagnostic Imaging, Newport, Rhode Island, Aug. 12; "Normal Supratentorial Anatomy" for a categorical course on MR Imaging at an ACR meeting, Montreal, Canada, on Sept. 7-8; "Radiology of Stroke" and "CT in Evaluation of Low Back Pain" at the Joint Michigan State University and Hurley Medical Center Radiology Program held in Flint, Michigan, on Sept. 20-21; and "CT and MRI Anatomic Correlation," "Basic Approach to the Lumbar Spine," "CT and Angiography of Cerebrovascular Occlusive Disease," and "Evaluation of Lesions of the Spinal Cord" for the 1985 Harvard Postgraduate Course on Neuroradiology and Head and Neck Radiology, Boston, Sept. 30-Oct. 4.

**Bahman Emami, M.D.**, discussed several research projects on lung cancer and hyperthermia during the Radiation Therapy Oncology Group meeting held in Philadelphia, Pennsylvania, on Jul. 22-23.



# UPDATE

**William A. Murphy, Jr., M.D.**, made the following presentations: "Skeletal Applications," at the Recent Advances in Magnetic Resonance Imaging meeting, University of Pennsylvania, Philadelphia, on Jun. 8; "Clinical Studies with Magnetic Resonance Imaging," 2nd International Symposium on the Synthesis and Applications of Isotopically Labeled Compounds, Kansas City, Missouri, on Sept. 4; "Breast MRI," and also served as moderator for the "Body MRI" session, for the Categorical Course on Magnetic Resonance Imaging, which was sponsored by the American College of Radiology and held at Montreal, Canada, on Sept. 8; "Breast MRI," "Forensic Radiology," "Musculoskeletal MRI," "Paget Disease," "TMJ Arthrography," and "Pathophysiology Rheumatoid Arthritis" for Radiology in Portugal: 7th International Congress, which was sponsored by the University of Connecticut and held at Madeira and Lisbon, Portugal, on Sept. 28-Oct. 6.

**Louis Gilula, M.D.**, served as a guest lecturer and spoke on: "CT of the Foot" for the St. Louis Radiologic Society on Sept. 3; "CT of Musculoskeletal System" at the Pitie-Salpetriere Hospital and "Penography of Foot and Ankle" for the Lariboisiere Hospital, Paris, France, on Sept. 24-25; "X-ray Approach to Painful Wrist" for the Medical l'Universite' Libre de Bruxelles, Brussels, Belgium, on Sept. 27; and "CT of the Foot," while serving as a session moderator, at a meeting of the International Skeletal Society in Edinburgh, Scotland, on Sept. 29-Oct. 5.

**Klaus Sartor, M.D.**, spoke on "MR Imaging in Disease of the Spinal Cord: Possibilities and Limitations" at the Annual Congress of the German Roentgen Society, in Nuremberg, West Germany, on May 16.

## Visiting Professors/ Guest Lecturers

**Klaus Sartor, M.D.**, while serving as an invited speaker, spoke on "MR Imaging in Spinal Tumors" at the annual meeting of the German Society of Neurosurgery, held in West Berlin, West Germany, on May 12.

**Todd H. Wasserman, M.D.**, discussed "Radiation Therapy of Hodgkins Disease" while serving as a visiting professor for the department of radiation oncology at New York University Medical Center, New York, on Jun. 24.

**Carlos A. Perez, M.D.**, served as a visiting professor/guest lecturer and spoke on "Clinical Hyperthermia with Emphasis on Interstitial Hyperthermia," at the Massachusetts General Hospital, Boston, on Aug. 5.

**Joseph L. Roti Roti, Ph.D.**, served as a guest lecturer at Northern Illinois University, on Jul. 22, and Argonne National Laboratories, on Aug. 13.

**Gilbert H. Nussbaum, Ph.D.**, served as visiting professor at Hospital Saint Louis in Paris, France, from Jun. 3-28. Invited by Professor Claude Jasmin of Hospital Paul Brousse in Villejuif and by L'Association pour la Recherche contre le Cancer, a French cancer foundation, Dr. Nussbaum evaluated the performance and potential of a novel, three-electrode capacitive heating device for deep-tumor hyperthermia. He also served as keynote speaker, discussing "Hyperthermia at the Mallinckrodt Institute of Radiology," during a symposium on hyperthermia sponsored by L'Association pour la Recherche contre le Cancer on Jun. 21 in Paris. Serving as an invited speaker elsewhere, he spoke on: "Improving the Clinical Utility of Microwave Surface Applicators" and "Longitudinal Heating Potential of Invasive Microwave Antennas Operating at 915 mHz," as a contributing presenter, at the annual meeting of the North American Hyperthermia Group, held in Los Angeles, on May 5-9; and "Pilot Program for RTOG Hyperthermia Quality Assurance" for the semi-annual meeting of the Radiation Therapy Oncology Group (RTOG), held in Philadelphia, Pennsylvania, on Jul. 20-23. Dr. Nussbaum also served on a National Institute of Health ad hoc committee reviewing Small Business Innovation Research (SBIR) Grants, in Washington, D.C., on Aug. 15-16.

**Joseph K.T. Lee, M.D.**, as an invited speaker, discussed "MR of the Male Pelvis" at the 4th Annual Meeting of the Society

of Magnetic Resonance in Medicine, which was held in London, England, on Aug. 19-23.

**Jay P. Heiken, M.D.**, while serving as a guest lecturer, spoke on "Computed Tomography of the Abdomen" at the County Medical Society meeting, Corpus Christi, Texas, on Jun. 10; and "Magnetic Resonance Imaging of the Liver" at New York University, on Sept. 12.

## Appointed



*Daniel R. Biello, M.D.*

MIR director **Ronald G. Evens, M.D.**, has announced the appointment of **Daniel R. Biello, M.D.**, as associate director of the division of nuclear medicine, effective October 1, 1985.

Dr. Biello came to Mallinckrodt as an intern in 1973. After serving as chief resident of the 1976-77 radiology training class, he completed a one-year fellowship in nuclear medicine and continued on staff at MIR.

Certified in diagnostic radiology and nuclear medicine, Dr. Biello is currently an associate professor of radiology at MIR, and additionally serves as an associate radiologist at Barnes Hospital, and as a consultant in nuclear medicine to both Children's Hospital and Mallinckrodt Diagnostics of St. Louis. His studies of pulmonary embolisms are well-known, as are the 40 scientific articles and eight book chapters he has published.

Dr. Biello received his undergraduate degree, cum laude, from Ohio Wesleyan University in Delaware, Ohio. At the Case Western Reserve School of Medicine, where he earned his medical degree, he was selected for membership in Alpha Omega Alpha, and honored with the Mosby Scholarship Book Award for Scholastic Excellence.



# NEWS UPDATE

**William A. Murphy, Jr., M.D.**, was appointed a consultant to the National Center for Health Statistics, of the U.S. Department of Health and Human Services, where he will participate in the evaluation of the National Health and Nutrition Examination Survey.

**Bruce L. McClennan, M.D.**, and **Philip J. Weyman, M.D.**, have been appointed editorial consultants for the Endourology Newsletter which is edited by Ralph V. Clayman, M.D., a urologist at the Washington University Medical Center.

**Todd H. Wasserman, M.D.**, has been appointed chairman of the subcommittee on Late Effects Scoring for Chemotherapy/Radiotherapy Effects and member of the review committee on Small Business Innovative Research grants for Experimental Therapeutics at the National Cancer Institute.

**John W. Wong, Ph.D.**, assistant professor of radiation physics, has received a courtesy appointment as assistant professor in the Biomedical Engineering Program in the department of electrical engineering at Washington University. Dr. Wong currently also holds a research associate appointment at the University's Institute for Biomedical Computing.

**Gilbert H. Nussbaum, Ph.D.**, has been appointed chairman of Hyperthermia Education and Training, which is a committee of the executive council of the North American Hyperthermia Group. Dr. Nussbaum was also recently elected councillor in physics, to serve a one-year term, on the same council.

**Bahman Emami, M.D.**, has been named vice-chairman of the lung cancer committee of the Radiation Therapy Oncology Group of the American College of Radiology. The 28-member committee meets twice a year and is responsible for the review and development of RTOG protocol studies focused on lung cancer.

**Louis A. Gilula, M.D.**, has been appointed to the executive council of the International Skeletal Society.

**Joseph L. Roti Roti, Ph.D.**, has been appointed a member of the finance committee of the Radiation Research Society and the Radiation Safety Committee of Washington University. He has also been named an associate editor for the Radiation Research Journal.

## Grand Rounds

**Bruce L. McClennan, M.D.**, spoke on "CT Staging of Renal Neoplasms: Pitfalls" at the Grand Rounds of the department of diagnostic imaging, at the Yale University School of Medicine, in New Haven, Connecticut, Oct. 10.

## Honors/Awards

**Robert J. Myerson, M.D., Ph.D.**, who is a radiation therapist in the division of radiation oncology, has been awarded the Career Development Award from the American Cancer Society. Previously named the Junior Faculty Clinical Fellowship Award, this grant was established to encourage promising candidates who wish to pursue academic careers in clinical oncology. Dr. Myerson is currently involved in investigations of magnetic induction in hyperthermia and the application of physics in clinical oncology.

**Gilbert H. Nussbaum, Ph.D.**, has been awarded a one-year institutional research grant of \$7,274 by the American Cancer Society (IN-36-Y-5) to conduct investigations of vasodilator-assisted hyperthermia of deep-seated tumors in the pelvis and abdomen.

## AAPM

**James A. Purdy, Ph.D.**, professor and head of radiation physics in MIR's division of radiation oncology, presided over the 27th Annual Meeting of Physicists in Medicine (AAPM), held in Seattle, Washington, August 11-15. Highlights of the meeting included a scientific symposium on "Radiation and Public Health", 27 scientific sessions covering a broad range of medical

physics topics; refresher courses; and over 100 commercial exhibits displaying the latest in medical physics instrumentation and equipment.

As this year's president of AAPM, Dr. Purdy conducted the two-hour President's Symposium: "The History and Development of Medical Physics Instrumentation." Traditionally, this symposium has afforded the current AAPM president an opportunity to highlight an important area in medical physics. Dr. Purdy chose to survey the historic role of physics in three medical specialties: radiotherapy, diagnostic radiology, and nuclear medicine.

Other members of the physics staff in Mallinckrodt's division of radiation oncology who attended the meeting were **Russell Gerber, M.S.**, **William Harms, B.S.**, **Richard Keys, M.S.**, **Leonid Leybovich, B.S.**, **Gilbert Nussbaum, Ph.D.**, **John Wong, Ph.D.**, and **Cedric Yu, M.S.** Also attending were **Carlos Perez, M.D.**, director of the division of radiation oncology, and **Beverly Kobeissi, M.B.A.**, division administrator and president of the Society of Radiation Oncology Administrators.

## Awards

At the Young Investigator's Symposium, **Mr. Yu**, a doctoral candidate in the department of electrical engineering who is under the supervision of Dr. Wong, was awarded second prize for his presentation, "Photon Dose Perturbations Due to Small Inhomogeneities." Drs. Wong and Purdy also co-authored the paper.

## Presentations

**Training and Education of Medical Physicists: Is the Present System Adequate?** J. Purdy

**Review of Quality Assurance Programs for Radiation Therapy Treatment Units** J. Purdy  
**Performance Evaluation of the CMS ModuLex Treatment Planning System for Pencil Beam Electron Dose Calculation** R. Keys, W. Harms, J. Wong, J. Purdy

**Improved Shaping of SAR Distributions with Microwave Applicators with Reduced Sensitivity to Surface Boundary Conditions** L. Leybovich, G. Nussbaum, W. Straube





NASA visitors Edward Beckenbach, Ph.D., left, biomedical program director, and Robert Selzer, M.S., far right, group leader, biomedical image processing, both of the Jet Propulsion Laboratory, with MIR radiologist Michael W. Vannier, M.D., center.

## NASA Commends Mallinckrodt Research

Two major NASA communications recently gave prominent recognition to a joint NASA/MIR project, directed at Mallinckrodt by associate professor **Michael W. Vannier, M.D.**, aimed at developing the application of multispectral satellite-image analysis to magnetic resonance (MR) imaging.

**Spinoff 1985**, the annual NASA report to the nation on space technology utilization, describes Dr. Vannier's efforts to improve medical imagery using Landsat processing techniques in a four-page article entitled "New Windows Into the Human Body." The report concludes:

"Dr. Vannier has collaborated with other physicians in applying satellite technology to NMR (nuclear magnetic resonance) scanning in scores of patient studies. He is now engaged in advancing the process one more

step: converting the Landsat computer program to a form compatible with the type of computer integral to the NMR system; that would allow expansion of the imaging technique to all NMR centers."

NASA also invited Mallinckrodt to participate in their exhibit at the **HealthCare Expo '85**, a public information symposium which attracted over 150,000 people to the Washington Convention Center in Washington, D.C., August 18-25. MIR contributed a scientific exhibit demonstrating practical applications of the NASA technology in diagnostic imaging, and additionally, Dr. Vannier and Robert Butterfield of the NASA Kennedy Space Center discussed the project in a two-hour scientific session. MIR's exhibit is now on display at the Kennedy Space Center in Florida. ■

## 3-D Imaging Comes of Age

Jeffrey L. Marsh, M.D., F.A.C.S., and **Michael W. Vannier, M.D.**, associate professor of radiology at MIR, recently published **Comprehensive Care for Craniofacial Deformities**, a textbook for radiologists, surgeons, internists, and other medical professionals. Divided into two sections, the book covers general concepts involved in the team treatment of craniofacial anomalies, and presents practical, step-by-step approaches to the diagnosis, treatment planning, and team management of specific craniofacial problems.

Unlike an earlier Marsh publication, the text contains hundreds of CT scan three-dimensional surface reconstructions produced at Mallinckrodt using computer software developed by Dr. Vannier. By sharing MIR's vast experience with this new

technique (over 1,000 clinical studies during the past three years), it is helping to make the medical community more aware of the advanced technology that exists and the benefits that will accrue to patients with severe craniofacial deformities.

Drs. Vannier and Marsh, a plastic surgeon at Children's and Barnes Hospitals, first developed the computer programs which generate 3-D images from conventional CT scans in 1982. In collaboration with engineers from McDonnell Douglas Corporation, Dr. Vannier later adapted a CAD/CAM (computer aided design/manufacture) system used to design military aircraft to the CT scanner and developed the reconstructive processing computer programs. ■

## MIR/St. Luke's Oncology Update

The annual Oncology Update Program hosted by the radiation oncology divisions of Mallinckrodt Institute and St. Luke's Hospital was presented on Friday, October 11.

Recent advances in the diagnosis and management of ovarian, testicular, and bladder cancers were the subject of the day-long seminar at St. Luke's. Distinguished guest speakers included Dr. Alon J. Dembo of the University of Toronto; Dr. M. Steven Piver of the Roswell Park Memorial Institute in Buffalo; and Drs. John Donohue and Stephen D. Williams of the Indiana University Medical Center in Indianapolis. Panel members from the staffs of Mallinckrodt Institute and St. Luke's included **Drs. Dennis Balfe**, Anthony Fathman, Andrew Galakatos, Deborah Gersell, **Jay P. Heiken**, **Gary Omell**, and **Miljenko V. Pilepich**. Drs. William McGinnis, **Delia Garcia**, **Pilepich**, and **Gary Ratkin** moderated the four sessions.

This year St. Luke's Hospital presented the first C. Alan McAfee Special Lecture, "Oncogenes: Implications in Cancer Induction, Diagnosis and Therapy," given by Dr. Mariano Barbacid, head of the developmental oncology section of the LBI Basic Research Program, National Cancer Institute, Frederick, Maryland. This lectureship, to be held annually in conjunction with the Oncology Update Program, was founded by the medical staff of St. Luke's to honor C. Alan McAfee, M.D., chief of surgery from 1969 to 1983 and well-known teacher and surgeon.

The Oncology Update Program was established four years ago by **Carlos A. Perez, M.D.**, director of the MIR division of radiation oncology, to provide physicians, residents, and other health care professionals with information about the most recent advances in the diagnosis and treatment of cancer. ■



# Michael Paul Capp, M.D., Scott Lecturer

*Dr. Michael Capp, left, Mrs. Wendell Scott, and Dr. Ronald Evens*



Michael Paul Capp, M.D., delivered the 14th Annual Wendell G. Scott Memorial Lecture on September 16 in Mallinckrodt's Scarpellino Auditorium.

Dr. Capp is a professor and chairman of the department of radiology at the University of Arizona College of Medicine in Tucson. The first ever appointed to that position, he has developed over the past fifteen years one of the country's most modern academic centers of radiology.

In his talk entitled "The Electronic Revolution and Medical Imaging," Dr. Capp traced the historical development of digital radiology from its inception in the earliest and most basic numerical counting systems to the current state-of-the-art involving capabilities for advanced image processing, storage, and display. Noting that radiology has made far greater technological progress in the past twenty to thirty years than any other medical specialty, he listed the radiological advances which succeeded and were influenced by World War II, including the image intensifier, catheterization techniques, ultrasound, and the use of radioisotopes.

Dr. Capp divided the technology of digital radiology into four main categories: receptors and TV, image processing, storage and display, and psychophysical imaging. After analyzing each category from an historical and developmental perspective, he expressed the opinion that most problems which fall into the first three categories have already been satisfactorily resolved and that much of the credit for these successes belongs to **Dr. Michel Ter-Pogossian, Dr. Michael Vannier**, and others at Mallinckrodt who have contributed toward the advancement of these technologies.

Looking to the future, Dr. Capp predicted that radiologists will someday



have the technological capabilities to see any organ in three dimensions, from any viewpoint and with any slice thickness; to perform whole-body angiograms; and to quantify amino acids, glucose, and other chemical substances in every organ system of the body. He also suggested that with the development of electrocardiograms and technology relating to biomagnetic fields, computers may one day be able to interpret radiographic images using their own "artificial intelligence."

Dr. Capp received his medical degree from the University of North Carolina in 1958, and completed a pediatric internship and a three-year residency in radiology at Duke University. Before assuming his present position at the University of Arizona in 1970, he was director of pediatric radiology and radiologist-in-chief of pediatric cardiology at the Duke University Medical Center for eight

*Dr. and Mrs. Scott's daughters, Mrs. Charles Wallace, left center, and Mrs. Michel Ter-Pogossian, with Dr. Ter-Pogossian, left, and Mr. John Sheperd*

years. His national leadership in cardiology and radiology has included presidency of the North American Society of Cardiac Radiologists, the Eastern Radiological Society, and the Council on Cardiovascular Radiology for the American Heart Association (AHA).

The Wendell G. Scott Lecture was established in 1972 by friends and colleagues of the late Dr. Scott as a living memorial to his excellence in teaching and leadership at Washington University, and in radiology and medicine. An accomplished scientist, physician, and educator, Dr. Scott was associated with Mallinckrodt Institute and the Washington University School of Medicine throughout his forty-year professional career. ■



# FORUM



*Michael J. Welch, Ph.D., served as president of the Society of Nuclear Medicine from June 1984 through May 1985.*

## Dr. Welch Discusses Low-level Nuclear Waste Disposal

With January 1, 1986, fast approaching, time is running out for congressional action regarding the disposal of low-level nuclear wastes. The 1980 Low-level Radioactive Waste Policy Act requires that by the beginning of 1986, each of the 50 states be responsible for disposal of its own nuclear wastes. However, the likelihood of all the states meeting that deadline now appears slim. That means Congress must extend the deadline, a complex process that must be completed before January 1.

What must be done in light of this situation? What are the probable scenarios should the states and the Congress not act immediately? What are the consequences for medical research and treatment centers like the Washington University Medical Center. In recent months, **Michael J. Welch, Ph.D.**, professor of radiology and chemistry at MIR, worked in his official capacity as president of the Society of Nuclear Medicine to answer such questions and to draw attention to the problem, especially in the Northeast where the biggest waste-producing states have attempted to block the legislation. In an effort to stress the urgency of the matter, Dr. Welch has had an editorial opinion published in the May 8 **Baltimore Sun** and a letter in the March 30 **New York Times**.

Dr. Welch comments, "The definition of low-level radioactive waste specifically excludes spent or reprocessed fuel

from nuclear reactors, uranium mine and mill tailings, and uranium decay products. The disposal of those high-level radioactive waste products is not included in the proposed legislation for low-level disposal sites."

Currently the U.S. has only three commercial low-level disposal sites (in Barnwell, S.C., Hanford, Wa., and Beatty, Nv.). Because these states bear an unfair load in taking the wastes of the entire country, there is a threat that they may decide to close down operations completely. Should that happen before the states come to agreement on alternative sites, there could be a crisis affecting all radiation-related treatment and research as well as all drug manufacture or development. The ramifications are immense.

Dr. Welch explains, "Patients in the United States receive approximately 10 to 12 million nuclear medicine procedures annually. These procedures include such diagnostic tests as scans to measure bone mineral content for osteoporosis patients, studies of cardiac function in patients with heart disease, and methods of cancer detection in the liver, lung, breast, bone, and prostate. In addition to diagnostic tests, nuclear medicine is also used for treatment, as in radioiodine therapy for cancer of the thyroid gland."

"The benefit of early and accurate diagnosis far outweighs the risk of receiving the extremely small quantities of radioactive material administered in these procedures. Most nuclear medicine scans involve the same amount of radiation required for X-ray procedures."

According to Dr. Welch, "Something like 600 of the labs in the Washington University Medical Center—out of a total of 1200—use radioactivity. Over 50% of the research done in the Medical Center uses radioactivity in one form or another."

Dr. Welch continues, "The medical use of radioactive substances is not limited to the nuclear medicine

departments in hospitals. For example, 90 percent or more of all prescription drugs went through an approval process at the Food and Drug Administration that included metabolism studies with radiotracer methods. In addition, a major percentage of the biomedical research being done at universities and industrial laboratories requires using radioactive materials. A shutdown of low-level waste disposal sites could curtail development of new pharmaceuticals and future medical discoveries."

The fact that most of the radioactive wastes generated by hospitals are low-level means that these wastes will decay into a non-radioactive state within a relatively short time. Washington University's resources in terms of space and radiation safety personnel allow it to make provision for storing isotopes with a half-life of less than 90 days. Smaller hospitals do not have similar resources. Dr. Welch has high praise for Washington University's excellent radiation safety staff under the direction of **John Eichling, Ph.D.**, but he points out that temporarily storing wastes locally is not a long-term solution. Of course, the larger national problem would remain, regardless of attempts by hospitals or companies to deal with it individually.

Dr. Welch comments on the importance of radiation in medicine, "Science historians have described the medical use of radioactivity as the most significant advance in the healing profession since the invention of the microscope. From the discovery of X-rays and radiation nearly a century ago, the disciplines of radiology and nuclear medicine have emerged to provide non-invasive methods of diagnosing injury and disease...Next year will mark the 90th anniversary of the discovery of natural radioactivity. If state legislatures and Congress do not act quickly, it could also mark a major setback in the medical uses of this wondrous form of energy." ■



# From the



**Armand Diaz,  
R.T., R.N., FASRT**

# Technical Administrator

## New Clinical Instructor

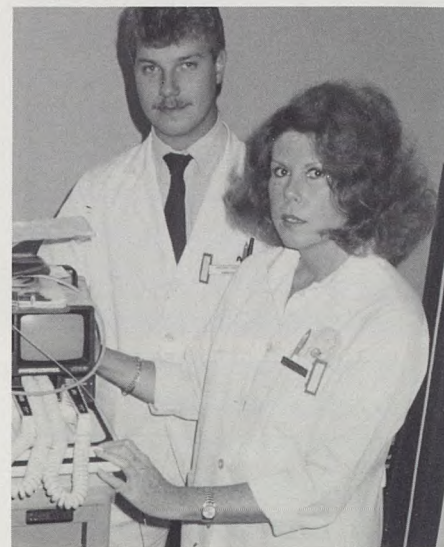
**Emilee Murray, R.T., B.B.A.**, has joined the MIR technology staff as a clinical instructor in gastrointestinal radiology and computed tomography.

As a clinical instructor, Ms. Murray's primary objectives will be to teach MIR's technology training students and to coordinate their learning experiences in the GI/CT section. Twice previously a member of the MIR technical staff, Ms. Murray also served in this position from 1979 to 1982.

Ms. Murray received her radiation technology training at Georgetown University in Washington, D.C. Certified by the American Registry of Radiologic

Technologists, her professional experience includes three years on the technical staff at Peter Bent Brigham Hospital in Boston, where she was an assistant technical supervisor and clinical instructor in gastrointestinal procedures.

During the past two years, Ms. Murray has been an investigator, assigned to study and report on the scenes of violent or sudden deaths, for the City of St. Louis Medical Examiner. Additionally, she holds a bachelor's degree in business administration from the University of Illinois.



*Emilee Murray, R.T., B.B.A., right, describes the use of Emergency equipment to technology student, Greg Hudson*

## Lazzari Retires

After nearly two decades of service to the Mallinckrodt Institute, **Vince Lazzari**, who is the supervisor of electronics, will retire on October 31st, fourteen days after his sixty-fifth birthday.

During the seventeen years he's worked for the Institute, Vince has worn more than one hat: he's been an electrician, plumber, electronics

specialist, and supervisor. But, most of his years at Mallinckrodt have been spent on the repair and regular maintenance of a large part of the Institute's mechanical equipment, which includes everything from a mobile X-ray unit to a water pump that can be built by a number of different manufacturers. Along with the knowledge of a lifetime spent around all kinds of machinery, the list of tools he has had to use includes at least one hundred different kinds of hand and power tools and electronic testing devices.

As building maintenance/electronics supervisor during the years 1969 to 1980, he oversaw the work of as many as fifteen different workers and technicians involved in the maintenance of the Institute's lighting, heat, air conditioning, electricity, water supply, and its equipment, not to mention the laundry and delivery services. As the Institute grew, these areas became more specialized and a reorganization of duties in 1980 made him the

supervisor of electronics alone.

Vince first encountered the world of machines on the Lazzari family farm, in northwestern Arkansas where he was born and raised. As a boy, he watched his father, an Italian immigrant, and elder brother fix tractors, trucks, and the stationery engines used to run the farm's power generator, grain mill, and water pump. And as he got older, he also began to operate and repair these machines. At the age of 22, he would be exposed to another kind of machine: the airplane.

An enlisted airman in the United States Air Force, Vince learned how to keep airplanes fit for flying and how an airplane engine runs. But because World War II was on, Vince decided to leave this work to go into training as a Cadet. In 1944, he graduated as a navigator with special skills in radar. The following year he was sent to the Pacific outpost, Guam, where he flew with a small, specialized crew on a B-29; this 10-man crew was always sent out alone, on radar bombing missions which took place at night or during bad weather. The crew had flown one mission over Japan and several over



*When X-ray cassettes are damaged, or worn, Vince Lazzari, supervisor, and others in electronics try to salvage as much of the expensive, lead-lined cassettes as possible*





Barbara Hasse, nursing supervisor in radiation oncology, looks over a patient's medical chart with clinical aide, Dot Gross

neighboring Pacific islands before the war would end in 1945.

When Vince returned to the mainland in the Spring of 1946, he moved to Missouri where he and his fiancée, Ann Aimerito, would marry, build a home in Southwest St. Louis, and raise five children. He gained a job in the installation division of Western Electric, where he learned more about electrical wiring and circuitry. From there, he moved to the Medical Depot, a service and supply house of medical equipment for the United States Armed Forces, where he would combine his knowledge of mechanics, electricity, and electronics in the repair of X-ray equipment. He continued in this line of work at Picker X-ray Company (now called Picker, International) for several years before coming to Mallinckrodt in 1968.

When he retires at the end of October, Vince says he will be looking forward to just "not having any definite plans. There are a few things I'd like to improve on in my family's home. The neat idea is that I can do that and other things when I choose. I like that."

## Quality Care: Goal of Nursing Supervisor Barbara Hasse

Despite the steadily increasing number of patients treated each year by MIR's division of radiation oncology, **Barbara Hasse, R.N., B.S.N., M.A.Ed.**, the division's new nursing supervisor, plans to continue providing the quality, personalized care for which Mallinckrodt is known.

"Keeping patients comfortable is our goal," she says. "We have to be very organized because we see a large number of patients each day, and it is important that we expedite their treatments as quickly and efficiently as possible."

"We also try to be family-oriented. Usually the whole family is affected by the diagnosis of cancer, so we try to be available to talk with them about the diagnosis and treatment, and any problems or fears they might have. Listening to our patients and answering their questions is important to everyone in the division," she adds.

One of eight clinical aides on the nursing staff is assigned to each patient during the first visit and consultation. Throughout the treatment process, the clinical aide serves as that individual's personal adviser and liaison to the oncologists and other members of the treatment team.

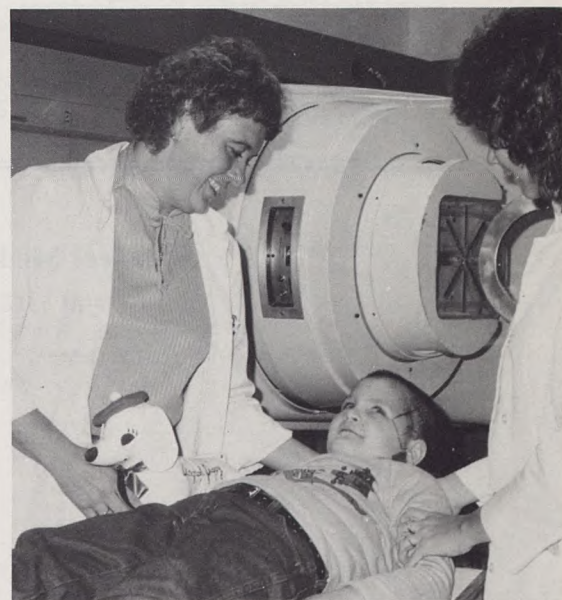
Oncology nurse specialist **Cindi Maag, R.N.**, and assistant nursing supervisors, **Shirley Davis, R.N.**, **Faye Jennings, R.N.**, and **Debbie Von Gerichten, R.N., B.S.N.**, help to manage hundreds of protocol studies involving radiotherapy, hyperthermia treatments, and radiation implants that are performed at Mallinckrodt each year.

Ms. Hasse explains, "We advise patients about proper skin care, diet, exercise, and other aspects of their

cancer therapy. As with other members of the treatment team, we try in every situation to improve the quality of life for the patient."

Compassion and caring for others, as well as extensive professional experience, are qualities which Ms. Hasse brings to her new position at MIR. She obtained her diploma in nursing from the St. Joseph's Hospital School of Nursing in Alton, Illinois, in 1967. Following a tour of duty in the United States Army Nurse Corps which included nine months in a South Vietnam field hospital, and five years on the OR nursing staff at St. Joseph's in Alton, she earned her bachelor's degree in nursing at St. Louis University.

As a nursing consultant, case manager, and staff coordinator, Ms. Hasse worked for many years with developmentally disabled children and adults, before joining the teaching staff at the Barnes Hospital School of Nursing in 1981. She recently completed a master's degree in human resources management at Washington University.



Barbara Hasse, R.N., positions cancer patient Matthew S. DeVore for a radiation treatment at the Clinac 20 linear accelerator



# Technology Training

## Congratulations, Graduates



### Class of 84 Graduates 22 Radiologic Technologists

Front row, left, R.T.s Stephanie Korte, Rachel Plurad, Carolyn Bachle. Second row, R.T.s Sandy Farina, Raul Valdez, Beth Cullen, Barbara Ermer, Terri Hayden, Karen Colombo, Sue Aldridge, Joyce Wince, Martin Nobel, Kathy Carapella. Third row, R.T.s Josh Goforth, Evelyn Szachta, Colleen Smith, Mitch Cappel, Jeff Smith, Diane Bock, Michael Perks, Jenny Kimberlin, Jeff Wacker.

### Radiation Oncology

Front row, left, R.T.T.s Patty Mueller, Mary Ellen Brenner. Second row, R.T.T.s Marilyn Smith, Mary Beth Walker, Kevin Delehanty, Rose Ahrens, Kathy Keence. Third row, R.T.T.s Cindy Johnson, Stephanie Hanneke, Tom Moynihan, Mimi Baker, Lynda Brueseke.



### Nuclear Medicine

Left, C.N.M.T.s Sue Frazier, Mary Ososkie, Rebecca Trunnell-Hyman. Not pictured, C.N.M.T. Mark Brillos.





## Welcome, New Students



### 20 Students Enrolled in MIR Radiologic Technology

First row, left, Terry Sconce, Chera Prater, Douglas Busker, Marie Stein, Andrea Penberthy. Second row, Carol Tune, Laura Willman, Stephanie McNabb, Tonya Hayden, Caroline Hubert, Patricia Suntrup, Lisa Crawford. Third row, Tracy Fortner, Marcia Compton, Gregory Hudson, Derrick Stith, Glenn Foster, Mary Gibson, Cheryl Verdin.



### Radiation Oncology

First row, left, R.T.s Carmen Vizcarra, Kathleen Morris, Sue Nation, Patricia Zink. Second row, R.T.s Debra Johnson, Joseph Spencer, Sandra Evans, Denise Giffet.



### 1984/85 Award Recipients

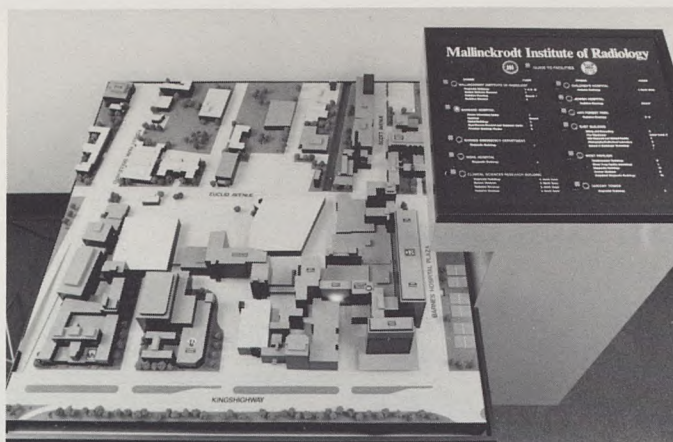
Barbara Ermer, Special Recognition Award for outstanding attitude, professional demeanor, and cooperation, and Jeff Wacker, Mallinckrodt Award for outstanding academic and clinical achievement.



## Architectural Model Installed in MIR Lobby

Visitors to the Mallinckrodt Institute of Radiology can now get a quick orientation to MIR's facilities. A three-dimensional architectural model of the Institute and its ten satellite facilities located within the Washington University Medical Center was permanently installed in MIR's first floor lobby in August. The scale model shows the entire complex and is electrically wired so that when an observer presses a button on the legend, the corresponding location on the model lights up.

The concept for the model originated with MIR director **Dr. Ronald Evens**: a scale model placed in a central location to provide a fast, convenient means of orienting patients, visitors, and staff to the widespread clinical and research areas occupied by Mallinckrodt Institute. Public relations director **Virginia Trent** coordinated develop-



ment and production of the model.

Built on a four-foot square base, the model is made of bronze Plexiglass, painted styrene, and plastic architectural details. Rooftops are color-coded to differentiate the buildings which comprise the Medical Center from those of the surrounding neighborhood, and styrene overlays show streets, parking lots, and sidewalks. The entire unit is protected by a clear Plexiglass box.

A legend is attached to the model on the right side. Eleven buttons on the legend correspond to specific MIR facilities on the model. The remaining

button sets in motion an electrical sequencer that takes the observer through all the locations, simultaneously lighting each MIR facility and the panel on the legend which describes that facility.

Response to the model has been extremely positive. Visitors have found it a more convenient tool than a two-dimensional map because they can quickly see the spatial relationships of the various hospitals within the medical complex. For the Mallinckrodt staff, the model serves as a tangible reminder of MIR's impressive size and scope.







*Up, up, and away!*

## High-flying Celebration

MIR director **Dr. Ronald Evens** and his wife Hanna will not soon forget their 25th wedding anniversary. On Friday, August 30th, they celebrated the occasion by going on a surprise hot air balloon ride, the first for both. Lifting off just before dusk, their balloon floated in a southwesterly direction over Chesterfield, beautiful Babler Park, and the surrounding countryside while about 50 family members and close friends kept chase on the ground.

The high-flying surprise and dinner party which followed were planned by the Evens' daughters Christie and Amy and son Ron, Jr., and his wife Nancy. (Christie and Amy are undergraduates and Ron is a graduate student at Washington University.) The event was made more special by the presence of Dr. Evens' parents, Robert and

Dorothy Evens of Herculaneum, who will celebrate 50 years of marriage later this year.

As might be expected, Dr. and Mrs. Evens returned to earth only to meet a barrage of questions about their ballooning experience. When asked to describe what it's like up there, Mrs. Evens replied, "Well, it's certainly different from watching from the ground — which we've done for years. Actually taking a balloon ride is exciting. When the propane burner that inflates the balloon is going, there's sound everywhere. But, once the balloon is high enough, the burner is turned off, and then everything is almost eerily quiet. Of course, the views and the peacefulness lived up to all our expectations."

Would the Evens' take to the skies again? "Definitely, yes," both replied. ■



*Dr. and Mrs. Evens aboard the woven rattan gondola, ready for liftoff.*



# CITY-WIDE RADIOLOGY CONFERENCE

St. Louis, Missouri, 1985-86

5:30 P.M.

RESPONSIBILITY FOR  
CLINICAL MATERIAL

Second Session (7:15-8:30 p.m.)

DATE	TOPIC AND PLACE	SPEAKER	
11/11/85	MIR Contrast Agents	Robert C. Brasch, M.D. Associate Professor of Radiology University of California, San Francisco	William A. Murphy, M.D., and Magnetic Resonance Staff
12/9/85	Computed Tomography of the Adrenal Glands	Stanley S. Siegelman, M.D. Professor of Radiology Johns Hopkins University	Stuart S. Sagel, M.D., and Chest Radiology Staff
1/13/86	St. Louis University	To Be Announced	
2/10/86	Update on the Treatment of Symptomatic Urolithiasis	Ralph V. Clayman, M.D. Associate Professor of Surgery Division of Urology Washington University School of Medicine	Bruce L. McClennan, M.D., and Adominal Radiology Staff
3/10/86	Critical Appraisal of the MRI Experience in Neuroradiology, 2000 Consecutive Cases	Mokhtar Gado, M.D. Professor of Radiology Washington University School of Medicine Mallinckrodt Institute of Radiology	Mokhtar Gado, M.D., and Neuroradiology Staff
4/14/86	Leroy Sante Lecture St. Louis University	To Be Announced	
5/12/86	Managing a Radiology Department	Murray L. Janower, M.D. Professor of Radiology Univ. of Massachusetts Medical School	Computers and Electronic Imaging R. Gilbert Jost, M.D., and Staff

## MALLINCKRODT INSTITUTE OF RADIOLOGY

AT WASHINGTON UNIVERSITY MEDICAL CENTER

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# FOCAL

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